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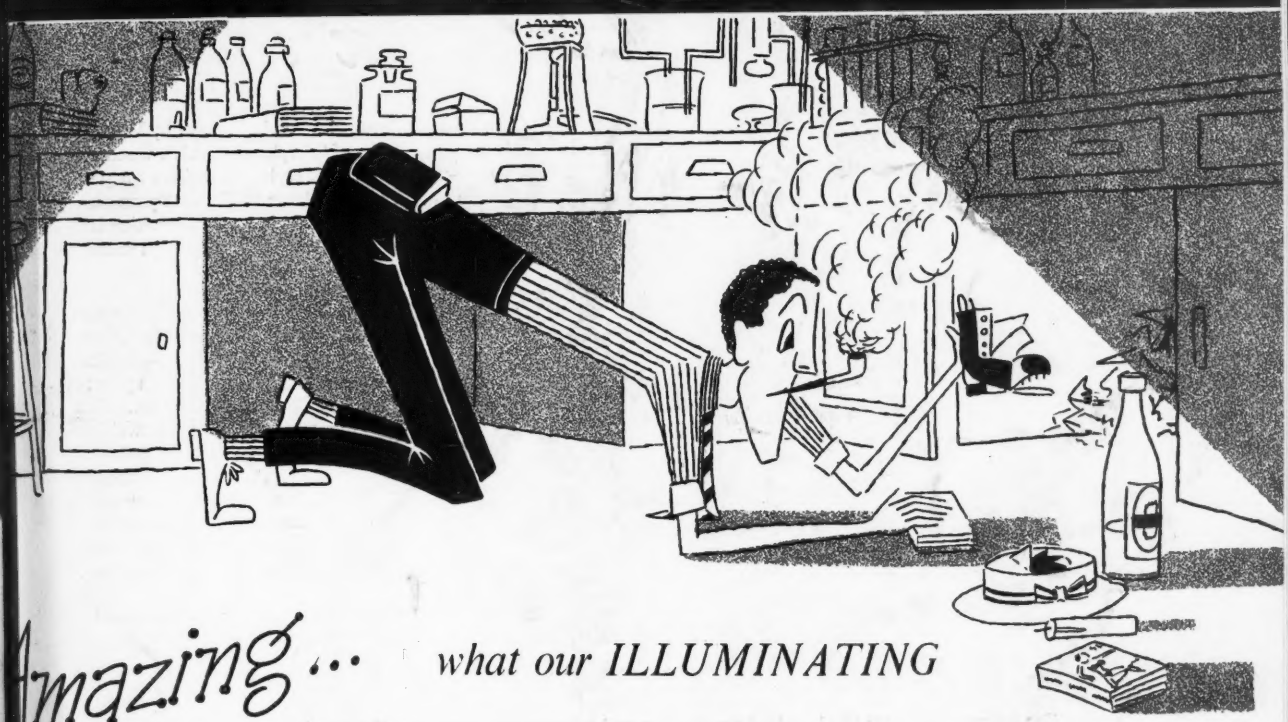

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LIGHTING

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contents

The Upward Trend

FOR our readers in all parts of the world we wish a happy and prosperous New Year. For ourselves it is to be another year of effort towards self-improvement. As a journal we are nearly 50 years old, but we are young in heart and ever anxious to enhance our value and interest to readers and advertisers, many of whom, we know, are appreciative of those improvements in the journal we have already made. There is much more we hope to do in the coming years but, as it is with you dear readers so it is with this journal—the cost of living is still rising! So, for a while, we must curb our impatience to make bold but costly improvements, although we shall continue to raise our standard of production little by little and some changes to this end begin with this issue. Incidentally, in terms of the purchasing power of money, the journal is cheaper now than it has ever been.

Notes and News

OF all the jobs we have to do the one that probably gives us most pleasure editorially is reading the manuscript of the Random Review of the year. From its very nature it is a job which has to be left until the very latest safe moment, and when the copy arrives on our desk it takes precedence over everything else. We read it most carefully, not for the reason mentioned by Mr. Penny towards the end of the 1955 review, but because we don't want to miss anything; in fact on our first reading we forget to be editors and just become readers. We must say it makes good reading —you just don't know what's coming next.

As a review of this kind is very much a personal matter we allow the author rather more freedom than usual. For instance if he wishes to speak of *foot-candles* or fluorescent *tubes* he may do so however much we may disapprove of such terms. We are pleased, however, to note this time the use of *luminaire*, a term which is gradually being accepted in this country.

I.E.S. Summer Meeting

Mention has already been made in these columns of the I.E.S. Summer Meeting which is to take place from May 8-11 at Harrogate.

Attendance at these meetings is around 400, a comfortable number not calling for too much regimentation but permitting people to mix and to get to know one another with ease.

There must be a lot of members of the I.E.S. and others connected with the industry (for the meeting is not confined to members) who have not yet attended a Summer Meeting and who wonder whether attendance is worth while. One answer is that nearly all those who attend once attend every time; they say they would not miss it—some say they cannot afford to.

Those who have not yet been to a Summer Meeting should think about it—if necessary see the boss and make him think about it too.

When people ask if it is worth while they usually mean is it, from a business point of view, something of value for the time and money it costs? We would suggest that the value of the meeting does not rest with the technical papers and visits, valuable as they are, but mainly with the contact with other people. During a meeting such as this, held in pleasant surroundings where everyone is thrown together for a period of two or three days, one makes much closer contact with people from all branches of the industry than during one's normal activities. Whenever a number of experts, business men or people with a common interest get together they are bound to learn from one another; they will learn more from the general exchange of information, gossip and shop than they will sitting at their desks and drawing boards. In our everyday occupations we get immersed in detail; we cannot see the wood for the trees; our own problems seem very important and we forget those of other people. Summer Meetings help us to get things into the right perspective, to learn what other people are thinking and doing. In fact the Summer Meeting provides a stimulus which is well worth while.

☆ ☆ ☆

A new feature will be a pre-meeting tour for overseas visitors. The intention is to leave London by coach on the morning of Sunday, May 6, visiting Windsor and Oxford before spending the night at Stratford-on-Avon. The following day the party will visit installations in Birmingham and Coventry and get to Sheffield by evening. On Tuesday morning a visit will take place in Sheffield, and after lunch the party will go on to Glass Bulbs Ltd. at Harworth and then to Harrogate. The tour will be made by road; the cost including hotels, meals and fare will be £10 per person.

Overseas visitors wishing to take part in this tour should notify the I.E.S. secretary as soon as possible. If sufficient support is not forthcoming the tour will not take place; though no doubt some I.E.S. members in this country will be pleased to help fill the coach—in which case they might lodge a claim now in case the opportunity becomes available.

Fluorescent and Tungsten Lamps

At a recent meeting the statement was made that already in the United States more fluorescent lamps are in use than tungsten lamps. Apart from mild surprise expressed by one speaker in the discussion the statement was not seriously challenged—the audience being no doubt too shocked to react at the time.

The statement, however, prompted us to look up the figures published by the United States Department of Commerce on types of lamps sold during the last few years. These figures show that the number of fluorescent lamps (hot cathode) and general service

Left:—*Regent Street*

Above:—*Selfridges*

tungsten lamps sold during 1952, 1953 and 1954 were, rounding off to the nearest million:—

Year	Fluorescent	Tungsten
	(Millions)	
1952	82	709
1953	97	751
1954	98	781

We hesitate to draw any conclusions from these figures other than the obvious one.

The increase in the number of tungsten lamps used may be due to a number of reasons, but as the increase is mainly in the lower wattages, i.e., up to and including 150-watt, we would hazard a guess that it is at least partly due to increased effort in the domestic market. No doubt there are people in the lighting industry in this country who have already studied these figures and have been able to interpret them more critically than we have done. We hope our surmise about the domestic market is correct and that it will encourage greater effort here.

As for the original statement we cannot imagine how it came to be made and hope for enlightenment in due course.

All Lit Up

Of all the decorations put up at different times by the Regent Street Association to attract shoppers to their part of the West End, those put up for Christmas were probably the most successful. The scheme, designed by Beverley Pick Associates, consisted of a canopy of 1,200 outsize snow-crystals made from expanded aluminium slung from carrier wires stretched across the road between the roof tops with "snow-crystals" at different levels, the lowest just clearing the tops of the buses.

The crystals were illuminated by specially designed G.E.C. floodlights housing 1,500-watt angle burning tungsten lamps mounted vertically on walls and balustrades of the buildings on each side of the road at about first floor level. The floodlights were designed and trained to throw their beams upwards towards pre-determined points on the buildings on the opposite side of the street. To prevent glare from the road and pavements the floodlights were fitted with louvres. For the whole length of Regent Street 162 floodlights were used at approximately 30-ft. spacing.

The whole effect was most attractive. It is interesting to note that the floodlights, which are easy to erect and to dismantle, are intended as semi-permanent fixures in Regent Street, where they will be used on other festive occasions, permanent supply points having been installed for this purpose.

Another centre of attraction when London is *en fête* is Selfridges. This Christmas the decorations were enlivened by changing-colour fluorescent lighting designed and installed by Thorn Electrical and the staff of Selfridges. We wonder whether this set-up will follow the Selfridge Coronation decorations out to Australia.

Dow Prize Competition

In the October issue we gave details of the next Dow Prize Competition, which takes the form of an essay competition on the subject "How I Look at Lighting Engineering." The closing date for entries is February 29. The competition is limited to members of the I.E.S. and we suggest that those anxious to bag one of the prizes (25, 15 and 10 guineas) put their thinking caps on without delay —two months soon slip by.

Boots Cash Chemists (Southern) Ltd., Southampton; an example of the tendency in shops to use large composite fittings.

Random Review of 1955

By A. G. PENNY

INTRODUCTION

To anyone concerned with new developments, as I am, there is constantly the problem of observing, or detecting changes in contemporary thought, demands and ambitions. In a competitive world it is, furthermore, important to detect these changes quickly, and to anyone possessing a component of imagination (which is an essential perquisite for all those who are associated with new things) the problem is doubly difficult; how to distinguish between the hazy idea in the mind's eye and the indistinct smudge on the horizon which may herald the coming of a new invention ?

It is thus with some caution that I offer the opinion that 1955 may have been a landmark in the art of lighting. Yet so it appears to me, for as I see it the year has marked the acceptance by the lighting engineer of the artist as an equal partner in the business of lighting. Acceptance is perhaps the wrong word, implying as it does some opening of gates hitherto closed—which is hardly the case, because the engineer has been trying to get the artist to help for many years. Indeed, this was a recurrent theme during the first session of the I.E.S. in 1909. What I really mean is that in 1955 the engineer has at last found that the artist can really help—and the artist has in the process at last managed to understand the engineer's language.

Now if this is really so, it heralds a new era in the development of lighting. No longer will it be necessary to restrict the lighting field to comparisons in terms of foot-candles, for the engineer can now comprehend other aspects of lighting than that of illumination. Because the artist can now tread with confidence, colour can become an integral part of the planning stage of a scheme. I say " planning " because I think there are few lighting schemes which have been planned hand-in-hand with the planning of the colour scheme. Rather have the two been developed separately with the artist hoping that the lighting scheme will not too greatly distort his ideas and with the lighting engineer hoping that his plans of brightness patterns (mentally, if not actually, conceived in monochrome) will not be entirely ruined by unexpected colour contrasts.

So far as I can judge, this collaboration is still in the embryonic stage; neither partner is entirely confident or sure of his ground, but here and there are coming into existence teams which can work together to produce—more often than chance would dictate—schemes which are satisfactory aesthetically and engineering-wise.

The present conditions may perhaps be likened to the situation in the street lighting world 25 years ago, when the test point foot-candle rating was failing to satisfy even the photometrician; an era when arrogant youngsters were prepared to argue that the brightness of the road surface as seen from the driving seat of a car was more important than all the test points in the world. Once the principle was accepted, ways and means were soon found of getting the right brightness by rule rather than by rule of thumb.

Nevertheless, these developments will bring a difficulty which may prove hard to overcome. It is the problem of spreading the knowledge through the industry. To-day the budding lighting engineer is hard put to find a teacher unless he lives in one of a few favoured cities. Even in such a progressive city as Birmingham I hear that, owing to shortage of teachers, it is not possible to study for the City and Guilds examinations—nor even to take lighting as a subject for the I.E.E. Shortage of teachers is, of course, not restricted to the world of lighting and is indeed a national problem. Let us face the fact that if the industry is to progress it must see that young graduates are properly trained. The shortage of teachers (especially lecturers for evening classes) is due to the simple fact that the reward is not worth the effort. No amount of talk can conceal this

one elemental fact. You won't get trained engineers unless you have competent teachers, and you won't get competent teachers at to-day's salaries.

How long it will be before this national situation is righted I don't know, but my guess is that it will be some years. In the meantime it will be a tragedy if lighting development, now in its most interesting stage, is held back. I suggest, therefore, that the lighting industry will have to take over the job itself. There is no time here to go into ways and means, but there are several obvious courses. For instance, industry could set up a fund to be administered by the I.E.S. whereby promising young registered lighting engineers could be given a course in teaching and then be paid to teach students. They would be able to do it on a part-time basis (perhaps one day a week) so that they could continue in their normal employment. For premises—what better than the Lighting Service Bureaux? Whatever the solution, however, we must look to the training of the next generation of lighting engineers.

I praise the artist and the engineer and encourage their co-operation, but I must put in a word once again for the all-rounder. I hardly need mention that over-specialisation is a menace. The liaison within a single mind is far superior to that which can exist between separate minds; only when the several specialists needed for a task reside in the same being do we get something akin to genius.

I get some pleasure from contemplating a future wherein the I.E.S. stages an annual exhibition of members' paintings and receives an address from the President of the R.I.B.A. on "Some recent developments in electronic control gear for dimming electroluminescent wall lighting panels"!

Society Activities

Nineteen fifty-five has seen Mr. E. C. Lennox pass the presidency on to Mr. A. G. Higgins after a strenuous year of office characterised by some very forthright remarks on the inadequacy of lighting levels in many places and criticisms of the manufacturers about timidity in "promoting" better lighting. Who but Mr. Lennox would have chosen the presidential address to a cultural society to stir up our salesmen?

Equally laudable was the reaction to the unfortunate pamphlet on the lighting of churches issued by the Church Information Board. But so far I have not heard that they have decided to invite the assistance of the I.E.S.

Another interesting but little reported affair was the informal paper by Mr. B. S. Cooper on Fading by Light Sources, and in particular the steps taken to reassure the fears of Authority about the wisdom of using fluorescent tubes in museums. It reminded me of the investigation which took place before electric lighting was first installed in the House of Commons, when it was finally resolved that the eyes of Members would be adequately protected from the injurious ultra-violet rays emanating from drawn wire filament lamps by the use of an enclosing Holophane globe and a sheet of amber-coloured glass. The first Commissioner of Works remarked further, "An amount of illumination equal to one candle-foot is the minimum usually considered requisite for reading purposes . . . with the present gas lighting it is four-fifths of a candle-foot and the same amount, or more as I should think desirable, can be obtained with the electric lighting." The filament lamps have gone, but the amber glass remains still trapping the non-existent ultra-violet light (and much of the visible light, too).

A considerable effort was the Conference on Road and Vehicle Lighting organised by the Institution of Mechanical Engineers. Not enough is done to bring the road and car makers together to face the users of both. Are the street lighting experts right to advocate driving without headlights in lighted streets? Dr. Nelson doesn't think so. Certainly, the practice has had so much official backing that the recommendation to *use* dipped beams when the lamp posts are 15 feet high is completely unknown. Indeed, an attempt to implement it is resented by other drivers.

Provincial I.E.S. activities flourished notably in the North with the highly successful week-end at Peebles, and in the extreme South, where the fast-working enthusiasts in the Transvaal progressed from a Group to a Centre in 12 months. We look forward to the day when their chairman will be able to take his place with other Centre chairmen at the Council Meetings. At least, may we hope to see a representative at the Summer Meeting in Harrogate?

Mr. Higgins, in his Presidential Address, devoted a good deal of his time to a study of the responsibilities of the Society to the community at large. He suggested that the I.E.S. might well find it desirable to bring into its deliberations people who are not lighting engineers, but who are closely associated with lighting. I am sure this is a desirable—indeed, an inevitable—thing, and I hope the election to the Council of the architect Mr. John Reid will do something to accelerate this tendency. Mr. Reid is to be congratulated on receiving a silver medal for the design of "Forrest Modern" lighting fittings in Milan earlier this year. But at the same time we must regretfully observe that the second Dow Prize Competition was a flop. How comes it that only six teams of young architects and lighting engineers entered and not one good enough to merit the prize? Despite all the outward signs of prosperity and ambitious ideas for the future I feel somehow that all is not well. And why is it that the younger members who chatter so freely over a cup of tea and a bun seem to be content to sit in silence in the lecture hall? The present generation must surely be the least inhibited there ever was, but you would think them dumb of malice when the discussion opens. They will argue both legs off the donkey in the office or laboratory with no respect for anyone (especially the boss!) but not in the lecture theatre. I could understand it if they signed the register and then skipped off to the cinema or to an Espresso coffee bar, but just to sit and say nothing . . . very odd.

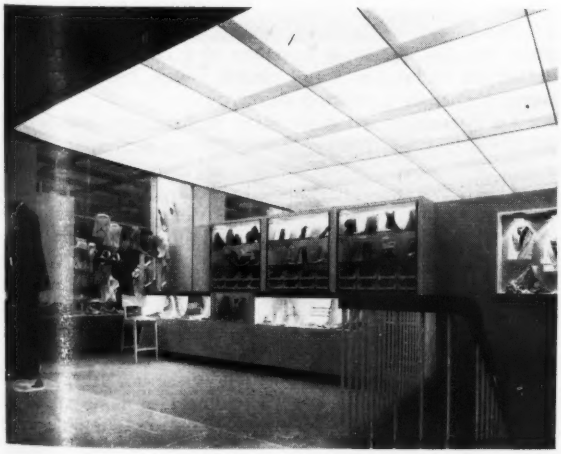
Conferences

The outstanding conference of the year was naturally the C.I.E., in Zurich, at which over 1,000 attended; an attendance which I think stretched the organisation to its limit. From the organisers' point of view it was terrific. There was the plan, and to the plan everybody conformed—or else! With 84 papers in series-parallel (or should it be push-pull) one was wholly absorbed in planning one's own logistical problems or rushing madly from one session to another. Just as if you stood in Piccadilly Circus long enough you would see everybody, so by sitting in the upper foyer of the Congress House you could see every delegate. But as for stopping one to talk to—well, when I tried to stop somebody I seemed to be about as popular as the Ancient Mariner holding up the wedding feast!

Again, when all the audience is wearing headphones it becomes impossible to conduct those brief but important asides with one's neighbour, which are the prelude to an intelligent discussion. The language problem is serious enough. As Bacon said "Travel in the younger sort is part of education; in the older a part of experience. He that travelleth into a country before he hath some entrance into the language, goeth to school and not to travel." But when your neighbour cannot hear you nor you him, the whole thing becomes useless. Nevertheless the fact remains that relatively few people are multilingual, and a system of

British Standard Contemporary. (*G.E.C. photo.*)

Owen Owen Ltd., Coventry. (*Philips Electrical photo.*)



Light and airy. (*Courtney, Pope (Elec.) photo.*)

simultaneous translation is the only alternative. With further experience it will, I think, become a very valuable aid to international conferences. Many people who have in the past stayed away because of the language difficulty will now be able to contribute. This will be a good thing because at international conferences it is important that national delegations should represent all sections. And here a tribute is due to the United States, who sent over 50 delegates. We certainly profited by their contributions which were extraordinarily well balanced and showed obvious evidence of much forethought. I hope they will be encouraged to send an even larger delegation next time. Brussels will be a conference not to be missed.

It was a pity that so little was heard of illumination developments in eastern Europe and the U.S.S.R., despite the attendance of quite considerable delegations. Had the arrangements been more elastic I am sure the vast majority of the Westerners would have been only too delighted to devote a whole day to hearing from these delegates about research, development and application. But to some extent the opportunity will recur for British audiences when Professor Havelka addresses the I.E.S. Summer Meeting at Harrogate on lighting in Czechoslovakia. It is to be hoped that Russian delegates and others from whom we hear so little will also be able to participate. (If they can, I hereby give warning to the British speakers that they will have to make room. It's no good being a member of the Organising Committee if you can't listen to the people who interest you!)

I felt that a notable session was the one in which Mr. Weston reported on the revision of the British I.E.S. Code for Lighting in Buildings, in which the Code has gone beyond the question of illumination levels and is now giving guidance on the less well appreciated but equally important subjects covered by the omnibus term "brightness." Especially satisfactory was it to hear that the principle behind the British Code has been adopted by many other countries.

Whilst understandably gratified at this recognition of British original work, I sometimes wonder whether standards of lighting are properly related to visual ability. Certainly it is reasonable to establish a minimum standard based upon ability to see with reasonable effort, and it is true that the British Code stresses that the recommendations are minima. Nevertheless, in the absence of *recommended* standards, how easy it is for officialdom to adopt minima as the Objective! And the day may not be so very far distant when there will be more Government legislation on the subject. I have before me a document issued by the Socialist Medical Association on eyesight in industry, which was discussed at a conference in the Houses of Parliament recently. The document praised the work of the I.E.S. in establishing minimum standards and called for them to be enforceable by legislation.

The fact that seems to me to be in danger of being overlooked is that it is *natural* for human beings to seek not minima but maxima. Whoever heard of a successful car manufacturer concentrating on minimum standards of comfort or trying to persuade people that they did not want to travel fast. Even economy of petrol consumption is held up as attractive only to those unable to afford a better vehicle. A few years ago the television industry had nine-inch tubes to sell and went around saying "in the average living room the visual angle of a nine-inch television screen approximates to that of an average cinema." Maybe you can see as well on a nine-inch as on a 21-inch tube, but who wants to? One day some enterprising man will start selling light and more light, taking it for granted that the customer wants more light and has no inhibitions about visual acuity, lumens per watt, economic life of lamp, cost per lumen hour and so on. Of course, such considerations should properly be considered for a factory project, just

Harrods, Ltd., London.
(*Courtney, Pope* (**Elec.**) *photo.*)

as every industrialist would want to know about ton-miles per gallon before he bought a lorry. Domestically, however, such considerations can only be regarded as irrelevant when, as Mr. E. C. Lennox pointed out last year, the average expenditure on electricity and lamps for lighting in the home is only 35s. per *year*, as it was when the I.E.S. first started.

Lamps

The practice of bulk replacement has still not come into its own, but in this age of scheduled maintenance I feel sure that it will some day, and maybe soon, become the usual thing. Old ideas die hard indeed and the lamp which has been in use several years and is giving perhaps 70 per cent. of its initial output is not recognised for what it is, namely an uneconomical nuisance. Lamp manufacturers have always talked in terms of average life, but when bulk replacement is the order of the day " life to so many per cent. failures " will be the important figure. The maximum tolerable proportion of individual replacement must vary with circumstances, but some target for the manufacturers to aim at will have to be agreed upon.

The lamp makers and users will some day have to set themselves another and even more arbitrary standard, namely the maximum tolerable variation of a lamp's light output. " Life to bulk replacement " will then be tied to lumen maintenance. Hard-headed lamp users will tell you that no one complains and production doesn't seem to suffer even when illumination values fall to 60 per cent. of their initial values, so why worry. The eye is perhaps the most adaptable part of the human being, and we are blissfully unaware of strains imposed on our visual mechanism by poor lighting; hence the lack of complaints. But there are hidden assets in good lighting. Running a car is rather similar—unless we are conscientious in our maintenance we don't notice that the brakes are gradually getting less and less effective. It may even take an accident to bring us to our senses. In any case it is surely better to decide just how much light is required and then plan to get it—no more and no less, rather than to start too high and hang on until someone squeals. Perhaps the trouble really is that life has become too complicated for " practical " men—for " practical " read " lazy."

As I have said before in these pages, many people are now delving into the economics of lighting, and quite rightly. There are, however, factors such as visual fatigue which cannot accurately be valued in terms of money. To cope with such factors, we must set ourselves standards by negotiation and then work out the economics within the limits of these standards. The work planned by the Building Research Station at Watford in connection with visual fatigue may help us here.

It is interesting to note that with lamps of long life and good lumen maintenance such as discharge lamps and fluorescent tubes it is, within wide limits, of little economic consequence when they are bulk replaced, apart from labour costs. One reason for this being that the cost of the lamp is then such a small fraction of the total cost of lighting. This fact should be considered by anyone thinking of using the new 400-watt mercury fluorescent lamp. The present list price of £9 seems very high, and although it is to be hoped that this will soon be reduced, it should not deter anyone from using this exceptionally useful lamp. The growing popularity of the present design is most encouraging to the backroom boys, and just as the first fluorescent tube emerged in a strictly utilitarian colour so we may not unreasonably expect further developments of new phosphors to produce de luxe versions of the mercury lamps. Such events will, I think, eventually put an end to the blended installation, with its depressingly low overall efficiency.

Circuits for fluorescent tubes continue to develop increasing complexity and ingenuity, but for the ordinary consumer there appears to be a welcome tendency towards stabilisation. Either the familiar switch start circuit or some variant of the preheated cathode " instant start " circuit (also known as Quickstart, Rapid Start, T.L.M., etc.) seem to be coming accepted as the two standards; whether " stripped," " striped " or " siliconed " tubes are eventually preferred time will tell, but at least the pattern starts to appear. Other rival circuits, for instance high voltage cold starting, pulse starting, internally conducting strips, etc., all seem to be settling down as having limited application for special use.

For this country, with the increasing use of earthed fittings, there would seem to be little point in not using the most reliable circuit which is generally accepted to be that using an electrode heating transformer with an earthed metal strip on the tube. The additional cost of the tube is surely a small insurance to pay for reliability when tubes last so many years, and when maintenance men cost so much.

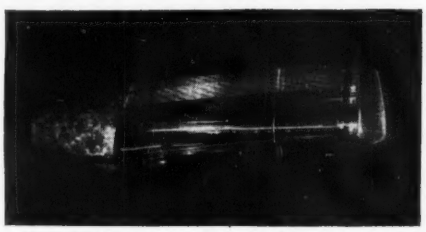
Some of the variants are attractive when an earth is not available, and as this is a situation all too frequent overseas outside the British Commonwealth, it is clear that a circuit for such conditions is necessary. Once again electrode preheating seems to be a necessity, but whether siliconing or some form of strip is best is not yet clear. It is interesting to observe the use in some countries of a metal strip connected through a high resistance to the phase lead. This is a practice frowned upon by various pundits of safety who point out that a " tickle " on top of a ladder can result in a fall just as fatal as a full electric shock, but I sometimes wonder whether it really is dangerous.

An interesting report on lamp performance comes from the United States, where the introduction is announced of a new glow starter switch, which prevents premature cold starting of 40-watt tubes. It is stated that accurate records have now established that in American capacitively controlled circuits (the " lead " section of a " lead-lag " unit) 30 per cent. of the lamps fail before 5,000 hours. With the new starter it is claimed that failures in both circuits are reduced to 3 per cent. This development in switch starting is an interesting reminder that the future does not necessarily lie with " instant start."

In recent years, and particularly in the last year, we have seen increased competition in the field of lamp manufacture, and we must remember, as I think most people actually concerned do, that the country as a whole is in an economic battle for survival which will rage more or less fiercely

An experiment in side street lighting using 4-beam lanterns. (*G.E.C. photo.*)

Sodium street lighting at Mountain Ash, Glamorgan. (*G.E.C. photo.*)



The "Opticell." (*Thorn Elec. Ind. photo.*)

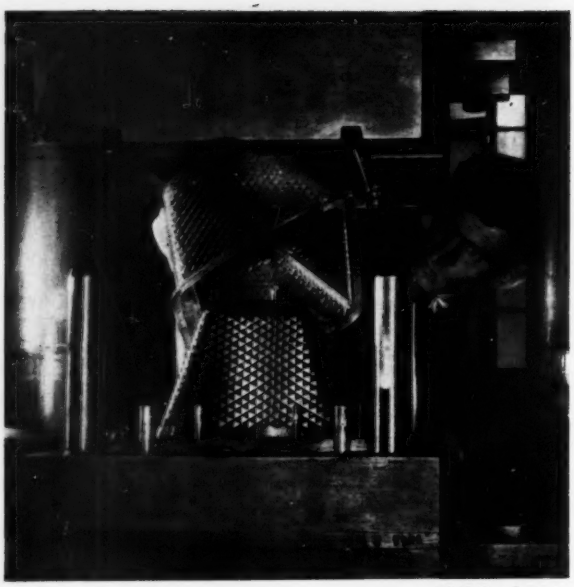
for as far into the future as any of us can see. Consequently it is essential that nationally we should make the very most of our resources. This means that there must be a large measure of pulling together for the common good with only just enough healthy competition to stimulate effort and maintain quality. The necessity for national and international standardisation becomes even more important.

Automation can help us to make better use of our resources and as this word seems to have come into its own during the past year it may be as well to say a few words on the subject here. Automation in practice means further elimination of the human operator not only with automatic manufacture but also with automatic quality control; quality control at present involves too much time and too much human labour even though the use of advanced statistical concepts enables the amount of testing to be reduced to an extent that horrifies some old stagers. The substitution of the machine for the man in production is a process which has been going on for years and will undoubtedly continue. The rate of progress has to a great extent, however, been limited by the economics of the moment and developments have seldom been sudden. Automation is not a revolution in industry but a logical step in manufacturing progress. The word itself may be regarded as a banner to rally manufacturers and spur them on to greater feats of mass production. It can mean a higher standard of living, and the lamp industry, interested in mass production methods from its infancy, is already making use of the idea.

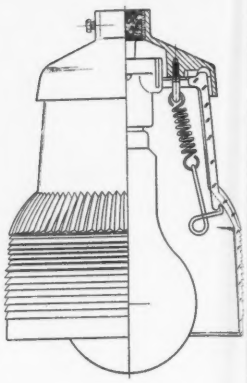
Xenon discharge lamps have been in the news rather a lot lately on account of their sunlight-like spectrum. I wish I could have been at Bayreuth to see the 6-kw. xenon lamps in use during the Wagner productions. The effect must have been exhilarating, for we seldom appreciate the serious lack of blue in the light from filament lamps. I detest the dark fugginess of our theatres generally; they need a good airing in most cases. Air conditioning could be one contribution to the process, redecoration another, and last but not least a radical change in our ideas of lighting. Personally, I think auditoria are much too dark. A study of desirable brightness patterns within the theatre might be a good start. Very high brightness contrast between stage and surround helps concentration on the performance but is visually fatiguing; two and a half hours is too long to tolerate the contrasts which prevail at present, hence the intense visual relief on emerging after the performance.

Xenon lamps have flourished mainly in Germany and their use in colour matching, artificial fading tests and film projection must be mentioned. The first application, however, is not apparently being taken up too enthusiastically in spite of the excellence of the light for this purpose. This may be because the lamps are so expensive, but is, I suspect, more likely to be because natural daylight is so

Fluorescent street lighting at Rayleigh, Essex. (*G.E.C. photo.*)



Diakon moulding. (*G.E.C. photo.*)



A neat design for side street lighting; the Holophane "Lumifractor."
(*Holophane photo.*)

plentiful and cheap. The second application, namely artificial fading tests, may possibly prove much more worth while, as up to now there has been difficulty in correlating natural and artificial results when using such sources as carbon arcs and mercury vapour lamps. Xenon lamps may well prove useful for projection not only on account of increased screen illumination but also on the score of colour rendering. In this latter characteristic they definitely have an overwhelming advantage over the compact source mercury and mercury-cadmium lamps which have been tried for film projection in the past from time to time. I cannot help wondering, though, how often the advantages will justify the cost of the lamps and auxiliary gear. One attractive idea is that of using only one projector instead of the usual pair, in conjunction with oversize reels.

When I look back over the long series of new light sources developed during the past 30 years, I often think it odd that none of them has so far been of any real use as a light source for film projection. We still cannot do much better than use an "old-fashioned" carbon arc or tungsten filament—not, of course, that these sources are no better than they were 30 years ago, but there it is. Discharge lamps and fluorescent powders have done nothing except confuse projection engineers.

Although the carbon arc is making a gallant effort to stage a come-back in the motion picture studios, so far only a limited success has been achieved, and larger and larger incandescent filament lamps are being demanded by the film industry. No sooner did lamp makers get the 10-kw. studio spotlight lamp in production than the industry was asking for a 20-kw. lamp. I note the trend, and can only comment that lamp makers are doing their best to keep up. It would be only appropriate if by 1959, when the I.E.S. celebrates its Jubilee, the industry is manufacturing 50-kw. lamps on a routine basis.

Although I have not yet obtained full details of the new Sylvania R.F. lamp for film projection and printing, I could not help but be arrested by its announcement in the American Press. The principle of heating a piece of metal by means of eddy currents induced by radio frequency magnetic fields is not new, but to use this principle to obtain a source of light seems to me to be a rather bold move. By this means a more or less uniformly bright area is obtained and this, it is claimed, gives more uniform screen illumination than is possible with the conventional types of incandescent filament projector lamps. Apparently the metal used is a selective radiator giving a colour temperature of about 4,000-deg. K. with a brightness comparable to that of a normal incandescent tungsten filament. Interesting as this new lamp is, I cannot help wondering once again whether the advantages will justify the cost of the oscillator.

The mechanical redesign of the MA-type mercury lamp by Crompton looks a very worthy effort, although one must reserve final judgment until more practical experience with the new design has been gained. We might do well to review the mechanical design of some other types of lamp. The radical redesign of sodium lamps has, in fact, been much in the minds of lamp makers for several years and it was very interesting to see the reticulated type of inner tube, which it is claimed reduces the movement of molten sodium, shown by Philips, and the integral type of lamp, which eliminates the Dewar jacket, shown by Osram during the A.P.L.E. Conference in September.

There is no room here to go into details of these new designs as they are complex and involve several inter-related factors. One certain thing is that these developments will stimulate others, and users can look forward to yet better mercury and sodium lamps. Theoretically, both these lamps should be capable of efficiencies considerably higher than those achieved to-day, so let us hope that the efforts of the research workers will be amply rewarded.

A development which is of great importance, but which is passing almost unnoticed, is the trend towards smaller dimensions. The urge of competition and the continued effort to avoid waste have, during the past 15 years, turned many lamp designers throughout the world towards the possibility of smaller bulbs for general lighting purposes. Slowly, through improvements in evacuation and gas-filling techniques, it has become possible to operate lamps at a higher bulb temperature without increased blackening, and with greater knowledge of capping cements it has become possible to persuade the cap to stick tightly to the glass. (Incidentally, it may interest many to know that this is an aspect of lamp engineering which has probably had as much attention as any other single subject, hardly excluding that of filament wire.)

During the last war the necessity for such economy forced many nations towards change, but unfortunately there was little collaboration, and, consequently, when the war ended.

pre-war standardisation had largely disappeared. In the past 10 years some ground has been regained but changes, once started, are not easy to stop and to-day there is an eagerness in many countries for further progress.

In the smaller sizes the problem affects the user only a little; indeed, it appears as wholly beneficial. A check can be made to the ever-increasing cost of manufacture, and in many cases it becomes possible to use a more powerful lamp —which is an easy way to raise standards of lighting. But in the larger wattages the problem is a wider one. Luminaires for larger lamps are frequently designed to control the distribution of light and to limit glare from a predetermined position of the light source; if this is changed, the performance of the fitting is adversely affected. Similarly the heat emitted by lamps is a major problem for luminaire designers; few present designs have any margin of safety in regard to lampholders and wiring thereto. Smaller lamps bring the source of heat nearer the sensitive parts. These problems are, of course, well appreciated, but a settlement acceptable to all can be hard to achieve.

Collaboration between E.L.M.A. and E.L.F.A. has always been strong, but it will undoubtedly be tested by any further proposals by the lamp makers. On the other hand some sizes of British lamps are to-day larger than their overseas competitors and further reductions are threatened. Furthermore, there is the growing fashion towards multiple lamp fittings where many small lamps of relatively low brightness (silverlight finish) are used naked. This fashion—of Italian origin—may well follow the present "contemporary" rage as quickly as the latter followed the "Scandinavian" mode of three years ago.

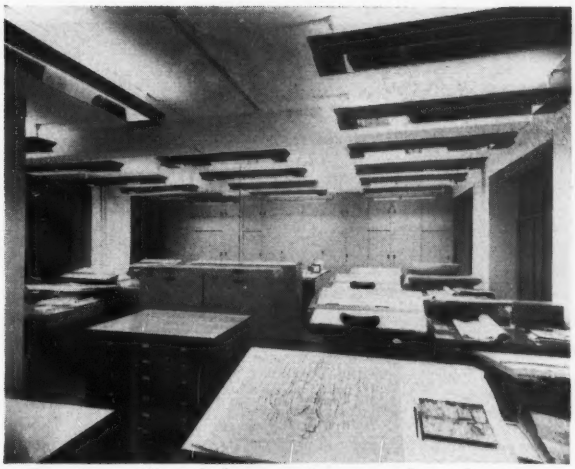
Such developments place a premium on the value of good designers because the manufacture of luminaires will go a step further than the all too common recipe of "Take a lamp, enclose part of it in something which looks more expensive than it really is, and serve with a sauce of publicity."

This tendency (smaller bulb size) is not restricted to general service lamps and, indeed, it is perhaps most in evidence in the automobile and aeronautical field. Many a modern motorist gets a surprise when he goes to change a side lamp and finds something the size of a flashlamp. Soon he will be finding—or overlooking—lamps of the "sub-miniature" type hardly larger than those used for many years in the medical profession and perhaps even without a cap. Similarly, in aircraft there is increasing use of edge lighting of panels by means of miniature lamps sunk in the thickness of plastic panels. It is an old technique of the sign maker originally popularised by A. W. Beutell and still widely used in cinemas and theatres. It is now brought up to date in the "Plasteck" system which, in an ingenious way, provides white instrument dial marking by day and red by night. Another advantage is that all the instruments on one panel can be lighted from only one or two bulbs.

Home Lighting

Advertising is often maligned, often abused, but unquestionably it *sells*. And it is surely not a coincidence that home lighting is poor and that the advertising effort on domestic lighting is negligible. One reason for this lack of effort may well be that there are no large—really large—makers of domestic lighting. Whatever the reason, however, I think that the success of the REAL Plinth Light is evidence of the value of advertising. Here is a unit, simple but effective, which in five years has established itself by modest advertising and is now to be found in almost every reasonable electrical shop in the country. I understand a fantastic number has been sold.

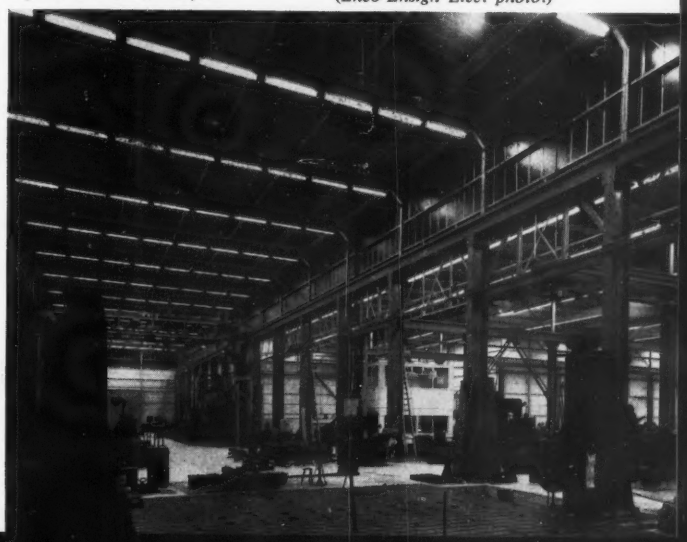
The situation is not quite as bad as may be thought because there is plenty of evidence that the demand for



Drawing office lighting using specular aluminium reflectors to avoid skirt glare. (G.E.C. photo.)

Born 1878 and still going strong. 750-watt G.L.S. lamps in a high bay. (Benjamin Electric photo.)

Loewy Engineering Co. Ltd., Poole. Hot cathode fluorescent at 40 ft. (Ekco-Ensign Elec. photo.)



Glenn Mills (Colne) Ltd. (*Benjamin Elec. photo.*)

Fluorescent fitting.
(*Ekco-Ensign Elec. photo.*)

contemporary lighting equipment is booming in a way never before experienced by the domestic lighting industry.

Whether the fashion for such designs will continue or not, it must follow that domestic consumers will continue to want at least as much light as they are now using. Then, too, a new generation is arising who have never lived in an age when electric lighting was expensive; so they have no traditions to hold them back. To the young, the statement that one can burn a 100-watt lamp for 10 hours for the cost of a box of matches is a factual remark which is accepted without question; their fathers knew it to be true, but never really *believed it*.

Whether anyone in the E.A.W. reads *Light and Lighting* I do not know; nevertheless, it is nice to think that perhaps my suggestion of a joint I.E.S.-E.A.W. campaign for better home lighting in some way stimulated them to decide upon home lighting as their subject for this winter's activities. They have chosen to co-operate with the Lighting Service Bureau rather than the I.E.S., and I must admit that I can hardly blame them when I reflect that the L.S.B. has been telling people how to do it for many years, and indeed possesses on its staff several real experts including Richard Freeth, who, I suppose, has more practical experience in this field than any other Briton. Conversely I recall a recent I.E.S. past-president, not unrenowned for his knowledge of lighting applications, who confessed publicly that he could not light his own home to the satisfaction of his wife.

Seriously though, some good work is being done. A colleague tells me of a case where a neighbour drew attention to the fact that one of my friend's table lamps was two inches too high; on being challenged he produced the B.T.H. booklet on home lighting which he had picked up off the local retailer's counter. Whether two inches off a table lamp really matters is not important, but it goes to show that educational advertising is effective.

There was some correspondence in *Light and Lighting* (January and February) between Mrs. Jacobs (*née* Claire, of 32, Victoria-street) and Mr. J. G. Holmes, on the subject of unobtrusive domestic picture lighting. Mr. Holmes' solution was to put a table lamp near the picture or the picture near the lamp, and it was with interest that I observed in the October issue of the American I.E.S. Transactions that a Miss Freyer had presented a paper on this subject. The paper is accompanied by no fewer than 23 illustrations of how to bring the pictures and the lamp into conjunction.

A recent visit from Miss Ivey—independent consultant to the General Electric—produced some interesting information on home lighting activities in the United States. After many years of propaganda for lighting the home properly, the G.E. have decided to stress the need for light for the job, arguing that if there is light for each domestic chore (dish-washing, reading, etc.), then the house will be properly lighted. Millions of booklets have been sold for a penny or so to retailers and electricity supply authorities. Shops and stores have been persuaded to demonstrate not merely floor and table standards indiscriminately, but "matching sets" or "pairs" specifically designed to cater for all the jobs in one room (or a whole house), and which have an appearance to harmonise with the general décor. Miss Ivey said it was the first time anyone had ever been able to make a real impact on the domestic lighting market. It had already resulted in a significant increase in light utilisation in the home.

I remarked last year on the negligible use of fluorescent lamps in the home and, so far as I can judge, the situation remains unchanged, although a few more makers are now offering suitable luminaires. Obviously the vogue is all contemporary, and as yet there are few, if any, contemporary fluorescent luminaires; which is odd when you think how easily a standard batten could be contemporised by the addition of metallic side shields painted red and punched with the star-shaped holes without which no luminaire is authentically contemporary. Nevertheless, Ekco-Ensign, in collaboration with the D.S.I.R., have recently marketed one fluorescent fitting which could properly be called contemporary and which, incidentally, has a higher efficiency than many others.

It is gratifying to observe the interest which home lighting now creates, misplaced though some of it may appear to be. There is no doubt that to-day everyone setting up home or even moving to a new one gives quite a good deal of thought to lighting, and, what is more important, can get plenty of advice from the many periodicals which compete for the attention of the woman of the house. Furthermore, Electricity Boards are sending their showroom people for education and training in home lighting. I

noted with interest a reference in one electrical journal to a course by the Lighting Service Bureau for showroom demonstrators in the Bristol area; but with 13 million homes spending only 35s. a year, there is a long way to go.

Shop Lighting

The value of lighting as a salesman is now so widely accepted that it is natural to look to the shopping world for early utilisation of any new lamp. Nevertheless, it has come as a surprise to many to find an enthusiastic acceptance of the colour-corrected mercury lamps in shops. The first reaction was, of course, that the colour rendition was inadequate, but somebody (Mr. W. R. Stevens, I believe) had the bright thought to combine them with tungsten to form a super blended installation which, when tried, gave a brilliant appearance more akin to sunshine than any artificial light so far developed. With memories of pre-fluorescent shop windows fitted with alternate tungsten and mercury lamps it was a simple step to develop a form of lighting for shop windows which I predict will spread round the world inside five years. Nothing has ever equalled the "punch" from small sources in silvered glass reflectors, and now, allied with a hard but true colour, the new system will surely be a "must" for all progressive shops, save perhaps only those for whom the need to be different is paramount.

One of the outstanding advantages of this system is the economy with which high intensities can be obtained. With an overall efficiency twice that of conventional tungsten lighting, lighting intensities of 300-ft.c. and upwards can be achieved without overheating; indeed, for many materials it now becomes possible for the enterprising shopkeeper to rival the sun for half the year with a 1,000-ft.c. installation.

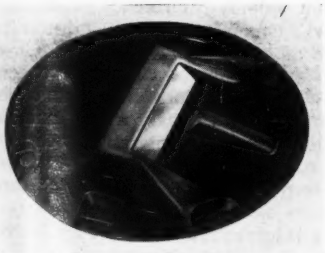
I feel bound to comment that another good reason for the growing popularity of blended shop window lighting (favourable economics and good colour apart) is the "anything you can do I can do better" philosophy. And a very good philosophy it is, too. A well-dressed window deserves to be seen, by night as well as by day, and perhaps this new lighting technique will come to be regarded as an essential adjunct to the well-dressed window rather than a means to an end in itself. At least there is no doubt that its use introduces a highly competitive element into the rival displays of adjacent shops or stores.

On a different aspect of this matter let me recommend the Special Supplement 4—Lighting the Confectioner's Shop (Window Lighting) published by the journal *Confectionery Shop*. Here at last is a wealth of concise information in what I would describe, with the greatest respect, as handyman's language. This is not a treatise on illuminating engineering but a simple account of what's best and why. I asked for this sort of publication last year (see *Light and Lighting*, January, 1955, p. 16). I've got it now, and I like it.

Again, last year, I made reference to earlier comments about reflector spotlight lamps, and I find that the demand for clip-on reflectors to convert G.L.S. lamps to reflector types is steadily increasing. I recently noticed one West End shop window with 42 reflector spotlight "eyeball" fittings, of which 18 were equipped with spotlights and the remainder were fitted with standard G.L.S. lamps—unassisted by any form of reflector. Shortage of reflector spotlights could have been the reason, and maybe shortage of clip-on reflectors as well. There we have it, perhaps—Hobson's choice whichever way you look at it. When the reflector lamp production can meet demand, the large number produced should result in a lower price, and perhaps the clip-on reflector will not be so attractive. Alternatively, when every electrician has his spare reflectors to hand, as he now has his cord-grip lampholders, perhaps the spotlight lamp will be a thing of the past.

Interior lighting in shops seems to be following an established pattern except maybe for the growing use of the modular ceiling. Though not necessarily as complex as the Frenger type, complete with its heating, the modular ceiling with square or rectangular sections carries its recessed or semi-recessed lighting units and acoustic panels. Several manufacturers are supplying "built-in" lighting assemblies of this kind, and one comparatively simple though very effective interior can be seen in Owen Owen's of Coventry. As the illustration shows, this installation consists of twin 5-ft. trough fittings with decorative louvres. It would be interesting to have a display of modular ceiling assemblies at the next I.E.S. Summer Meeting.

There have been further efforts to avoid the clouds of luminaires, and one method which seems to be gaining in popularity is the use of larger and larger fittings. Marks and Spencer Ltd. are installing 8-ft. 125-watt fluorescent tubes at several of their branches, and Boots Cash Chemists (Southern) Ltd. have just put in an interesting new installation at their Southampton branch. The installation at Boots, which was designed by Mr. C. St. C. Oakes, is shown in the frontispiece, and is noteworthy not only as an example of the large composite-fitting tendency, but also on account of the bold use of an intentionally dark ceiling; the luminaires in effect provide no upward light. The fittings, manufactured by Pollards, are 15 ft. by 8 ft. and accom-



Holophane aerodrome runway light. (*Holophane photo.*)

The cargo loading bay, London Airport. (*Thorn Elec. Ind. photo.*)

modate U-shaped cold cathode fluorescent tubes and 150-watt incandescent filament spotlights supplied by Falk, Stadelmann.

The tendency to larger fittings is encouraging the use of the 8-ft. 125-watt hot cathode fluorescent tubes, and I note slight embarrassment of certain fittings makers who have no press capable of making large enough fittings in one piece.

Street Lighting

Mr. Waldram, in his presidential address to the A.P.L.E., described how much theory and experience had been condensed into the B.S.I. Code of Practice for street lighting. And Part II of this Code, which deals with the lighting of roads other than traffic routes, is, at the time of writing, on the verge of publication. The proofs have been discussed at great length at the A.P.L.E. conference and elsewhere, and the chief criticism seems to be the restriction of mounting height to the 13-15 ft. stipulated in M.O.T. report of 1937. Several successful installations have been put up in recent years with mounting heights of about 20 ft. either because it was convenient, as at South Shields, or because the status of the road seemed to be intermediate between the two categories of the code. I can only say that codes should help and not hinder, and that I was particularly pleased to note the remark of Dr. Gillbe at the I.M.E. conference on vehicle and road lighting, when he expressed the opinion that it was possible to overdo the modern craze for uniformity.

Public lighting engineers have been getting on well with the job of lighting or relighting our main roads. Sodium lighting seems to have gained more ground than mercury again this year, and I note further development of continuous lighting on arterial roads with sodium lamps in South Wales, notably along an 11-mile stretch of road at Mountain Ash. This is an ideal which may not be realised generally for many decades. It is, however, an answer to the headlight problem, and in the meantime we can only pray that more motorists will have their headlights properly adjusted.

Although the smaller mercury fluorescent lamps have established themselves fairly well for side street lighting in certain areas, where their colour-rendering properties have been appreciated, the more recently introduced 400- and 250-watt lamps have not yet found great favour, possibly because of their high price, but partly, I think, because lanterns which were designed for plain mercury lamps are not really suitable for them, either from the point of view of temperature or optical control. Nevertheless, interesting pioneer installations of 400-watt mercury fluorescent lamps are to be found at Blackburn, Blackpool and Glasgow.

Many fluorescent installations have been extended during the year but perhaps the most spectacular job of the year is that at Northampton, where a bold Borough Council commenced a long-term relighting programme in 1951. The programme was to relight all main roads in the Borough with New Warm White fluorescent tubes and all other roads with tungsten filament lamps, in accordance with the B.S.I. Code of Practice; so far about two thirds of the main roads have been converted, and a start has been made with the side roads. Already a significant reduction in night-time accidents is apparent, and the driver's life is less of a strain. The whole scheme at Northampton will involve some 23 miles of fluorescent lighting and it is of great interest to note that no appreciable increase in the rates is anticipated as a result. Good street lighting is not expensive compared with other highway costs. Well done, Northampton; I hope others will follow your lead.

Even the smaller country towns are installing fluorescent street lighting and Rayleigh, Essex, is an example. It will be noticed in the illustration how lanterns with vertical tubes take over from the lanterns with horizontal tubes in the centre of the town, so that in this area buildings and everything else shall be clearly visible by direct rather than silhouette vision.

I was very much interested by the paper presented to the A.P.L.E. by W. R. Stevens and H. M. Ferguson on the lighting of tree-lined roads. A four-beam distribution instead of the conventional two-beam type would seem to have application not only to tree-lined streets but perhaps to all side streets. The importance of the needs of the pedestrian and householder are rightly considered as being as important as those of the motorist; all side road users must be catered for. I think this four-beam distribution may have a big future; the experimental installation shown in the illustration seems to me to offer a great improvement without undue increase in power consumption.

I still cannot understand why uni-directional street lighting is not more common on dual carriageway roads, but if we can't have uni-directional lighting, need we have quite such a hideous forest of poles as is so usual? Why don't we learn more thoroughly the lessons of the Sidcup by-pass and the Autoroute de l'Ouest just outside Paris? In my opinion the doubling or trebling of the number of lanterns does nothing to justify the ghastly daytime appearance of many of our dual carriageway roads.

Mention must of course be made of Thorn Electrical Industries' entry into the street lighting world. In addition to a range of sodium and mercury lamps they are now marketing a number of lanterns. The most unusual of these —the Opticell—is designed for use with the 140-watt sodium lamp and its makers claim that it offers an ideal solution to maintenance problems. Being hermetically sealed, dirt is unable to penetrate the lantern although breathing is possible through a small filter plug. I look forward to the opportunity of seeing this lantern—which must surely delight the eye of the Council of Industrial Design—in a representative installation.

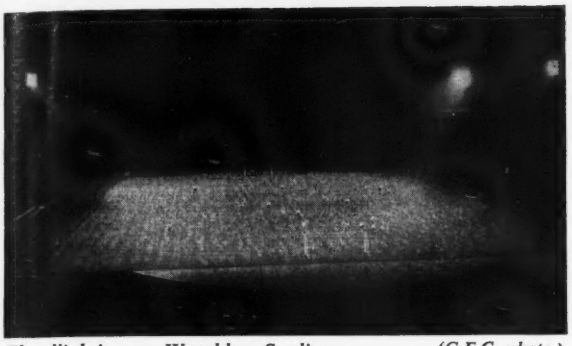
For use in lantern optics, glass and " Perspex " now have a competitor in " Diakon," developed by I.C.I. Although in its moulded form it is similar in many ways to " Perspex " this new material (for the uninitiated, a form of polymethyl methacrylate) is injection moulded to produce lantern dishes and bowls, and it is being used by several manufacturers.

The illustration shows a refractor bowl for a Group B sodium lantern being removed from the press, and the scale if not the total size of the equipment used can be appreciated. Rapid production rates and great repetitional accuracy are two important features of the process and, with the passage of time, it will be interesting to observe the extent to which " Diakon " establishes itself.

The B.T.H. " Star-Cone " Group B lantern and the Thorn Alpha One Opticell both employ " Diakon," as does the G.E.C. Plastifractor Bowl. One interesting detail of this last refractor is the presence of horizontal prisms on the inner surface and vertical prisms outside which can be cleaned by rainfall. There is a single helical horizontal prism on the inside rather than a series of individual parallel ones, so that after moulding the refractor is simply unscrewed from the ram. Just another advantage of " Diakon "—but glass is still attractive in its own right, as is shown by the new Holophane Lumifractor.

As time goes on there is less excuse for badly maintained car headlamps now that many authorities are issuing most helpful information. I have in mind the M.O.T. booklet " Road Worthiness " issued at the Hendon Vehicle Testing Station, and " Dazzle " issued by the A.A. The Harrow Road Safety Council are also to be congratulated on their leaflet " See to your lights before winter comes " in that, to my knowledge, this is the first attempt on the part of a local authority to draw attention to this vital matter.

I have in the past written at some length on the merits



Floodlighting at Wembley Stadium. (G.E.C. photo.)

Holophane church lighting fitting.
(Holophane photo.)

Greyhound track lighting at the White City.
(Metrovick photo.)

of Graves Type headlights with hooded passing beam filaments, and from personal experience of their use I am inclined to think that, subject to their short range, they are the most satisfactory form of dipped beam (although on wet roads they do give rise to reflected glare). The efforts on an international scale by the Working Party of the C.I.E. and I.S.O. to extend the range of this system without dazzling oncoming traffic will be watched with great interest by all road users.

Once again I have to inveigh against the galaxy of flashing lights that confuse the night driver. Flashing beacons at pedestrian crossings I now expect and sometimes recognise. Unfortunately these crossings seem largely to have failed in their aim of persuading pedestrians to use them in preference to other parts of the road. With this situation to be faced there is little merit in flashing beacons which merely announce the likely presence of pedestrians—and the few that do use the crossings too often misuse them. I could also comment on flashing traffic indicators, but since these are now the subject of a Ministerial investigation I should perhaps bear in mind the 14-Day Rule and say no more as yet.

Industrial Lighting

A quiet backroom battle rages still over the design of industrial lighting fittings—the rival merits of different finishes for reflector and canopy, the virtues of through-draught or dustproof design and preference for horizontal or vertical burning lamps have yet to be decided. I feel that the trend towards the use of higher wattage light sources is bound to weigh in favour of through-draught fittings, as with 1,000 or 1,500 watts of heat (effectively) being dissipated a totally enclosed fitting has to be very large. And again, when high wattage mercury lamps are being burned cap upwards a far greater proportion of the heat is dissipated in the vicinity of the cap than in the case of the large G.L.S. lamp with its greater proportion of thermal radiation from the filament.

For several years I have been predicting the eventual and virtually exclusive use of the colour-corrected mercury lamp for industrial use, and we can forsee this now more as a reality than a pipe dream. The range of such lamps is now complete up to 400 watts (and including 250 watts) at a price, and it might be a fair comment to add that until supplies can meet demand—will this perhaps take two or three years?—we shall not be able to assess the real requirements in relation to the less exotic but better known types of lamp. That the 250-watt and 400-watt lamps sell at all at their present prices would suggest, I submit, that there is far more to them than mere novelty. But substantial increases in manufacturing capacity will also result in considerable reduction in price, and once again I say "here is the lamp of the future."

The 1,000-watt mercury lamp as a class is establishing itself as a standard solution to high bay lighting problems. As yet the points of detail on the various designs have still to be resolved. When all the variables have been integrated into 1,000-lumen-hours per penny, is high voltage (400 volts across phase) preferable to mains voltage operation, is a vertical or horizontal light source required, and for how long will an inefficient glass lamp outprice an efficient quartz lamp (which will in the future be colour-corrected)? The market, by G.L.S. standards, is small but the stakes are high, and if since last year there seems little fresh to report there is behind the scenes, at least, a tremendous amount of thinking and planning going on.

Many lighting installations are still ruined by unsuitable orientation of fluorescent luminaires, and so I feel justified in showing an illustration of a cotton mill in Lancashire in which rows of tubes have been installed at right angles to rows of machinery, thus avoiding heavy shadows which it was found would be cast if luminaire and machinery were parallel. But I still think that lighting engineers neglect the question of shadows (or modelling). We talk about seeing mainly by brightness contrasts but do not always remember that in practice the most useful brightness contrasts are those caused not by differences of reflection factor but by shadowing. Eliminate shadows and you may well have made seeing more difficult. It is all too easy to get shadowless lighting, especially with fluorescent tubes, and with it unnecessary eyestrain; so let us give more thought to what I think the textbooks call the *Direct Component.*

For many years planners of lighting installations have urged the importance of proper cleaning in order to obtain the designed amount of lighting throughout the life of the

An attractive restaurant interior.
(*Courtney, Pope (Elec.) photo.*)

Contemporary lighting at Stratton Lane School, Biggleswade. (*Falk, Stadelmann photo.*)

installation, but in the vast majority of cases it is safe to say that "once installed, no sooner forgotten" has been the rule. This attitude has always been hard to explain, as it could always be demonstrated that money spent on maintenance was money well spent. It is to be expected however, that with rapidly rising maintenance costs, there will be growing interest in it from those who were indifferent when it cost so much less. Manufacturers, faced with ever increasing costs and contracting overseas markets, have come to look more closely at all the items of their budget and have found one hitherto ignored.

Be the reason what it is, I venture to suggest that the outcome may have some shocks for those who have glibly urged the importance of maintenance in the past. For instance, if group replacement of lamps is adopted along with the regular cleaning in order to reduce the cost of individual lamp charges, the average level of illumination will rise and the owner—if he has listened to all he has been told—may expect an increase in productivity from his factory.

Maybe he will get it, maybe not. And again, if he budgets on a 15-year life for the installation he may well start to wonder whether all the precautions taken by the best manufacturers of equipment are really necessary. For instance, stainless steel fastening bolts and protective coats of paint on alloy fittings are desirable if the luminaire is to be exposed to a corrosive atmosphere. But supposing it is installed in a nice warmly heated clothing factory or even in an air-conditioned laboratory? Then what is wrong with sheet steel and mild steel nuts and bolts with the minimum of paint? After all, the ceiling will probably get a coat of paint after five years and the fitting can easily be done too—often it is, anyhow. There is no time here to argue the rights or wrongs of these policies, but argued they certainly will be and perhaps the occasion will arise when the best will be found too good. It is interesting to note that already some makers, famous for their high standards, are offering less durable alternatives. Benjamin Electric have introduced a range of their industrial fittings with "Epikote" instead of vitreous enamelling. Personally, I think this change of attitude is long overdue. There are far too many installations put up 20 years ago by good makers, in their time outstanding, but which in spite of good maintenance are now just not good enough. The motor-car industry was often reproached for introducing new models just for the sake of novelty but hard economics now prevent frequent change with the result that a new model to-day is a noticeable advance on the old. And with this has come the ability of the designer to plan his car to last until the new design is available, but not much longer without a large repair bill. So to-day it costs no more to buy a new and better car every four years than to keep the old one going. When the lighting equipment designer can do the same, he will make possible a significant advance in ordinary lighting practice. Instead of being 15 or 20 years behind the best known technique, the gap between the new and the average may be narrowed to say five years.

Miscellaneous

An interesting piece of prismatic glassware is to be found in the new apron floodlight that the G.E.C. has designed for London Airport; it is pressed in hard glass, has a diameter of 19-in. and weighs some 14-lb. The rear face of the lens has horizontal prisms superimposed on vertical flutes to provide a wide spread in the horizontal plane and a carefully designed distribution in the vertical plane. The fitting itself is of light construction and replacement of the 1,000-watt Class B.2 projector lamp is made extremely easy by a removable cover at the back. The design of the modern apron floodlight need not be quite so critical as that of its predecessors, because of the greater mounting heights used: the fittings which are to light the apron round the central terminal buildings at London Airport will be mounted at 60-ft.

There is much interesting lighting at London Airport and almost every lighting firm can and does claim a share. I have already mentioned the apron floodlights and I would also like to mention the recessed fluorescent lighting in the Cargo Loading Bay and the specially designed fluorescent cut-off lanterns over the car park at the central terminal. Both these installations illustrate the care that has been taken to minimise the number of light sources visible to the pilots.

I wonder what the next lighting advance will be out on the field itself. Mr. Calvert, of Line and Bar Approach fame, thinks that it should be some aid for that critical time when a pilot has to change over from the approach to the landing itself. A fragment of time in which not a few accidents have had their origin. Is it to be floodlighting of the runway itself or what? In this connection Holophane have

developed a new runway light of the flush type. Its design is neat and sound, and I am assured that it will stand up to the exhaust from a jet engine or any other of the hazards it may be called upon to encounter. Evidently the flush type of fitting is still favoured in some quarters.

The R.A.E., at Farnborough, celebrated its Golden Jubilee this year, and I must admire the vigour and persistence that is shown by this vital organisation. I was very interested at the jubilee exhibition by the plan to use 24,000 special 1-kw. infra-red lamps, to heat the wing of supersonic aircraft in investigations connected with the heat barrier. Exceptional conditions have to be simulated, and exceptional methods are necessary. Even the switching on of 24 million watts presents some interesting problems.

The floodlighting of Wembley Stadium by the G.E.C. would seem to be one of the year's highlights in lighting for sport. Once again the tower lighting system was chosen after full-scale tests. Tower lighting seems to give better modelling, and thus easier recognition of the players, than other systems so far tried. At Wembley, eight 40-ft. towers are mounted on top of the stands, which give a mounting height above the pitch of 90-ft. and a total of 192 floodlights are mounted on the towers. It is interesting to note that 16 of these are slightly modified aerodrome apron floodlights which give a long throw with a very sharp cut-off above the beam, thus providing adequate illumination on the inside of players on the far side of the field (work that one out if you can) without causing glare to the spectators sitting in the front rows just beyond such players. The illumination values are about 20-ft.c. on horizontal surfaces and 20-30-ft.c. on vertical surfaces, which is good going for only 350-kw. One feature new to British practice is that the 1,500-watt G.L.S. lamps used are being deliberately over-run by about 10 per cent., with series resistors for use when switching on and, incidentally, for providing a dimming effect to emphasise dramatic moments. This over-running increases illumination values by about 35 per cent., whilst increasing watts by only 15 per cent. and current by 5 per cent. The expected lamp life is about 200 hours, which means a lot of football matches.

Greyhound racing has also had the lighting engineers' attention this year, and the White City Stadium track-lighting installation, designed by Metrovick and the Chief Engineer of the Greyhound Racing Association Limited, is worthy of attention. Ninety-eight specially designed cut-off fittings are employed, in each of which is burned a 400-watt mercury and a 500-watt tungsten filament lamp. The requirement was for a high level of track illumination with a relatively low electrical loading and at the same time plain mercury lighting was unacceptable both on the score of colour and stroboscopic flicker.

I commented last year on artificial lighting for football and tennis, and I feel the extension of really well-planned lighting to greyhound racing is particularly interesting. Whilst not an habitué of greyhound race tracks myself, I have noticed many very indifferent lighting installations at various tracks over the years; the White City lighting, however, is of a different order.

Church lighting has been studied by at least one manufacturer, and the Holophane 500-watt totally enclosed fitting, produced for churches or large assembly halls, is particularly worthy of attention.

An interesting new technique for making interior lighting fittings has been developed by Rotaflex Ltd. This method is basically the winding of extruded cellulose acetate tubing on to suitably shaped formers. I noted at the Building Exhibition at Olympia that the same method is used in making wastepaper baskets. So when you get tired of your luminaire you know what to do.

I see that the contemporary style has percolated to public buildings, and although rather a large number of lamps is used to light the hall at Stratton Lane School, Biggleswade, I must admire the artistic side of the installation.

Readers may remember my comments last year about the "deep, dark and dirty" bars in the States—they may even have felt that artistic licence could scarcely stretch to such a tale. There is a sequel to it, though. Read on . . . "Guns exchanged for light meters. The police in Houston (Texas) are being supplied with photo-electrical light meters in order that a new ordinance regarding a minimum of 5-ft.c. illumination in all eating and dining places may be enforced." This is freely quoted from the American journal *Business World*.

As this Random Review draws to a close it is perhaps desirable to emphasise something that should be sufficiently obvious; namely that it is a very personal review of things that have interested me in lighting during 1955. The operative word is "Random," which readers may like to know is defined by the Oxford English Dictionary as "without aim or purpose or principle."

I am very grateful to all those who have drawn my attention to new matters and have answered my curious and sometimes critical questions. But my interest does not extend to everything new, nor have I attempted to make a balanced survey of the year's progress. Least of all is the Editor responsible for errors and omissions. So far as I know, he only blue pencils paragraphs liable to land us both in front of a jury facing a libel action. For which relief much thanks.

Correspondence

'Light and Lighting'

Dear Sir,

I should like to congratulate the Editor of *Light and Lighting* on what appears to be a new architectural "look" which has appeared in the past few months; a trend which may help to bridge the gap between the architect and the lighting engineer.

The months of July, August, September and October pay particular attention to the relationship of lighting with architecture, and a step has been taken towards creating a review of contemporary architecture and lighting which if carried further should ensure that *Light and Lighting* is as much an architect's magazine as a lighting engineer's.

A further most useful step might be to arrange meetings between architects and lighting engineers to discuss and criticise new lighting schemes which are to be reviewed, the discussion then being fully reported in the magazine with no punches drawn.

In the June issue the subject of "Office Lighting" is analysed and dealt with in various different ways, and I should like to see this method extended in further issues gradually to cover other architectural programmes, such as schools, hospitals, homes, churches, etc., in a methodical manner which is suitable for filing by architects so that gradually a very complete information service is built up which would also include the information on new lighting equipment, systematised in such a way that all relevant data is given for design purposes about each fitting, again allowing easy filing.

One further point might be added. The cover of *Light and Lighting* is at present devoted to advertising matter which is generally of small artistic merit; I suggest that the cover might be redesigned, omitting advertising matter, and made more suitable as an object to be found in architects' offices. If the journal could then be brought to the notice of architects increased sales would compensate for any loss in advertising revenue.

London. DEREK PHILLIPS.

Lighting Abstracts

LAMPS AND FITTINGS

250. A new searchlight carbon arc lamp. 621.325

J. P. LATIL, *Illum. Engng.*, **50,** 378-380 (*Aug.*, 1955).

Details are given of a new carbon arc lamp developed for the automatic operation of searchlights from alternating current. The sequence of operations involved in striking the arc, automatically feeding the carbons and replacing them at the end of their burning life is described. The lamp operates unattended for 10 hours and has a peak beam candlepower of 15 megacandelas with over 10 megacandelas in a horizontal beam spread of 2½ deg. P. P.

621.327.43

251. Dimming low-voltage fluorescent lamps by means of a resistor.

R. WITTEKIND, *Lichttechnik*, **7,** 304-306 (*Aug.*, 1955). *In German.*

Describes the principles of regulation of a fluorescent lamp by means of a variable series resistor, with particular reference to the 40-watt lamp. The current can be reduced from 420 to 0.1 mA, when the light output is 1/2000 of its full value. In practice, to achieve a reduction of this magnitude it is necessary to use a combination of two resistors; in one the size of wire is graded, so that the unit is of convenient size. The advantages of resistance control are listed. These include instantaneous action, practically infinite life of the apparatus, dimming to a very low value without enhancing flicker and the possibility of using d.c. J. W. T. W.

LIGHTING

252. Some problems in television lighting. 628.972

W. C. PAFFORD, *Wireless World*, **61,** 288-290 (*June*, 1955).

The conflicting factors which govern the lighting of television studios are discussed. The cameras are relatively insensitive, have a very restricted contrast range (of the order of 20 : 1), need to be operated at a reasonable lens aperture for good definition, while keeping the main subjects on the very limited "straight line" part of the characteristic of the light receptor. Typical lay-outs of lighting are discussed in relation to their technical implications. R. G. H.

253. Lighting of central station high bay areas. 628.972

Illum. Engng., **50,** 395-403 (*Aug.*, 1955).

Gives general information on the lighting of high bay areas in power stations where the mounting height of the lighting equipment is 30 ft. or more above floor level. Specific requirements for different types of area (e.g., boiler rooms, pump rooms, etc.) are briefly considered. Recommended illumination levels, choice of lighting system, maintenance and the elimination of direct and reflected glare are also dealt with. P. P.

254. Color and the illuminating engineer. 535.6

Illum. Engng., **50,** 389-390 (*Aug.*, 1955).

Interim report of a committee set up to study the effect of colour in relation to the art and science of illumination and intended as a guide to the illuminating engineer in the use of colour. The present report defines the responsibilities of the illuminating engineer *vis-à-vis* the architect or colour consultant in the choice of surface colours and light sources in an interior. The effect of colour on vision and the emotional and psychological effects of colour are also discussed. P. P.

628.92

255. The study of natural illumination by means of models under an artificial sky.

E. E. VEZEY AND B. H. EVANS, *Illum. Engng.*, **50,** 367-374 (*Aug.*, 1955).

Describes the construction of the artificial sky and ground used by the Texas Engineering Experiment Station for daylighting studies in model rooms. Particulars are also given of the models themselves and the photometers employed. All measurements in the models are related to the simultaneous outdoor illumination on a vertical surface from the sky alone. P. P.

628.972

256. Modern fixed lighting underground in a coal mine.

E. HINTZMANN, *Lichttechnik*, **7,** 301-303 (*Aug.*, 1955). *In German.*

Discusses the special problems of mine lighting and gives a table of recommended values of illumination. For galleries the value is 4 lm/ft²; at the coal face 1 to 1.5. A standard type of fitting for use with tungsten lamps of 25 to 200 is described. There is in draft a standard specification for mine lighting with tungsten lamps. The author describes fittings for use with tubular fluorescent lamps, especially in the galleries, and he gives details and a photograph of a good installation with an illumination of 6 lm/ft². He considers that fluorescent lighting at the coal face is still at the experimental stage. J. W. T. W.

628.93

257. Return to the subject of methods for calculating illumination.

E. K. MULLER, *Lichttechnik*, **7,** 309-310 (*Aug.*, 1955). *In German.*

This is a criticism of a section of a paper by W. Jaedicke, published in *Lichttechnik* in March, 1955 (see LIGHT AND LIGHTING, p. 319, Sept., 1955). It gives some useful polar curves of light distribution from a cylindical source in various planes. J. W. T. W.

628.97

258. The lighting of hazardous and corrosive locations in industrial plants.

A. G. PALMER AND W. E. HARPER, *Trans. Illum. Eng. Soc. (London)*, **20,** 179-204 (No. 6, 1955).

Discusses the nature of fire, explosion and corrosion hazards in industry and lists the explosion characteristics of inflammable gases and vapours. Modern methods of protection are described, including flameproof equipment, pressurised systems, isolation of equipment from the danger area, and restriction of the danger area by structural expedients. Reference is also made to the use of automatic outdoor plant. The problems and protection methods arising out of the hazards connected with dusts, fibres, explosives and chemical attack are discussed and modern protection practice is broadly outlined. Several specific problems requiring solution are listed. W. R.

An Introduction to 3D Lighting Design for Architects

At some stage in the design of a new building an architect's conception of the ultimate appearance of the interior lighting becomes crystallised and has somehow to be brought to reality. The more commonly used techniques of lighting calculation are of little help in this respect since they are concerned only with ensuring a sufficient quantity of light on the working plane (2D lighting, in fact), whereas the architect's conception of his lighted interior is in terms of patterns of light and shade in a three-dimensional environment.

Probably the most important advance in the transition from 2D to 3D lighting design, or to the " design of the visual field " as it is called, was the realisation that the eye does not see illumination, but the brightnesses of surfaces resulting from illumination, and that the visual field should be designed, therefore, in terms of brightness, not illumination. Various techniques of three-dimensional brightness engineering have been devised, of which the 3 : 1 brightness ratio method originating in the U.S.A. and described in the following article is probably the most widely known. A limitation of these techniques is that, although the eye is stimulated by brightness, the sensation which is experienced may be apparently quite unrelated to the physical measurement of the brightness (i.e., to the luminance). For example, a luminance of, say, 10 ft.-lamberts corresponds to a dark shadow when seen outdoors in bright daylight, but appears so bright as to be almost glaring when seen at night time. Although the luminance has remained unchanged, the apparent brightness (or luminosity) has greatly increased. The reason for this is that the sensations produced by individual luminances in the field of view are influenced by the general luminance prevailing (i.e., by the adaptation of the eye) and by the interaction of adjacent luminances (known as simultaneous contrast). Any effective method of 3D lighting design must take these factors into account, otherwise it will not be possible to realise the architect's conception of his completed lighting installation by a strictly engineering approach. The first and essential step is to be able to specify the conception in terms of a pattern of apparent brightnesses which can then be translated into a corresponding pattern of luminances. A method which enables this to be done for certain limiting conditions has now been proposed and opens the way to " 3D apparent brightness engineering."

The following article by Dr. Dresler is likely to be of interest to those architects who are keen to acquaint themselves with this and other recent thoughts on 3D lighting design techniques. The article is essentially a summary of available techniques whose practical application is really in the province of the illuminating engineer. It may be that, as a result of reading this article, architects will inundate their lighting consultants with requests to abandon their 2D lighting calculations in favour of the newer 3D techniques.

3D Lighting Design

By A. DRESLER, Dr. Ing.*

One often wonders how many lighting men fully realise the tremendous over-simplification they are applying to the design of a lighting installation when they think of so and so many foot-candles on the working plane as being the one and only yardstick in which they and their clients need to take any interest. Naturally the more experienced among them have learnt that in addition to providing the required level of illumination it is just as important to cope with the more intricate and complex problems of luminance distribution over the whole interior, thereby taking into account such items as the control of direct glare and the colour treatment of interiors. However, this is often done by intuition or as a mere afterthought where much is left to " guestimation " or " artistic feeling."

So far there is no completely satisfactory method of design available that will enable the lighting man to

* The author is with the Commonwealth Department of Labour and National Service, Melbourne, Australia.

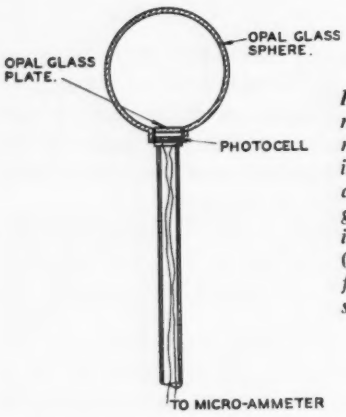


Fig. 1. Spatial illuminometer. This instrument measures the "spatial illumination" prevailing at the centre of the opal glass sphere. Spatial illumination is a measure (in lm/ft²) of the average flux density reaching the sphere's surface.

predetermine the general luminance distribution of an artificially lit room, but at least two attempts have been made to replace the conventional concept of illumination on the working plane by what a sub-committee of the National Illumination Committee of Great Britain has aptly called "the design of the visual field"(1).

This article endeavours to outline the many difficulties involved in such an approach, and will do so by describing briefly some of the more important suggestions that have been made to introduce into lighting design the idea of thinking in all three dimensions.

Early 3D Experiments

The inadequacy of limiting the design of lighting installations to the illumination on the working plane was first recognised in the late twenties when Lingenfelser(2) suggested that one should determine the "illumination distribution solid" at a point in a room to find out what is now called the modelling index(3). At the same time Arndt(4) introduced a rather bold 3D lighting design scheme which rejected the illumination on any one plane altogether and introduced a new concept into lighting which was called "spatial illumination." This is (average) illumination in lumens/square foot falling on a small sphere surrounding the point of reference. Fig. 1 shows the "spatial illuminometer." It is made of an opal glass sphere, the narrow neck of which is connected to an ordinary photocell.

A third scheme was proposed by Bloch(5), who was the first to measure the actual luminance distribution over the interior surfaces of a room and thus became a forerunner of the American "brightness ratio" school of the forties.

These various suggestions were all made by very competent lighting engineers who, despite their scientific approach, tried to pay attention to the practical aspects involved. How far they went can best be described by listing the three requirements which Arndt formulated in 1931 for his 3D lighting technique. They were :—

(1) To guarantee enough light on the job a minimum average spatial illumination throughout the whole room was required. The value to be chosen depended, of course, on the kind of work to be done in the room.

(2) To control the degree of shadowness the ratio of average direct and average indirect spatial illumination was to lie between a specifically stated minimum and maximum value (direct illumination = illumination produced by the light coming directly from the fittings; indirect illumination = illumination produced by inter-reflection between all interior surfaces of the room).

(3) To prevent direct discomfort glare it was required that the maximum spatial illumination (i.e., that produced in the immediate neighbourhood of the highest luminance of the whole room) should not exceed the average indirect component by a certain amount. This requirement was numerically based on Holladay's(6) glare research.

It should perhaps be added that simple equations and diagrams were also prepared which made it quite easy to predetermine the two components of average spatial illumination as well as the maximum illumination. Although this 3D lighting scheme was certainly far ahead of any design method used at the time it was too revolutionary, and probably also too "scientific," to be acceptable to the practical lighting man. Thus it remained an *avant-garde* expedition into "space" and was soon forgotten.

Almost simultaneously with these early experiments of a few lighting engineers, Gershun and Gurewic(7) approached the problem from a totally different angle, namely, that of the theoretical physicist. Their starting point was the idea that, since light is a form of electromagnetic radiation differing only in wave-length from that used to produce electric and magnetic fields in the realms of telecommunication and power generation, one should think of visible electromagnetic radiation as being capable of producing a "light field." In searching for the concepts which would characterise the behaviour of such a light field they established two concepts, one being a scalar (i.e., non-directional), the other a vector (i.e., directional). While the former was identical with Arndt's "spatial illumination," the latter was something quite new and was called "illumination vector." This concept is rather difficult to visualise, but the best way to get an idea of what it means is to explain how it is measured.

Suppose we take a lightmeter with a cosine corrected photocell into a room lit by one or more light-sources or fittings in the usual way and select a point P anywhere in the room, for which point we want to determine the illumination vector. All we have to do is to hold the photocell so that its centre coincides with P and to turn the cell slowly around itself into all possible directions until we obtain that direction at which we get the highest reading on the lightmeter. An imaginary arrow pointing out of the back of the cell would then give the direction of the illumination vector and the reading on the dial of the instrument would give us its magnitude. In other words, the illumination vector is a vector whose magnitude is equal to the maximum flux density available at a point and whose direction is at right angles to the plane through which this maximum flux density passes.

Needless to say, apart from a few very special cases with "point sources" in a room with black walls, i.e., in photometry, nobody has yet been able to show that there are any practical advantages to be gained from having or using this "illumination vector." From the theoretical point of view, on the other hand, it is, of course, very intriguing indeed that we can think of our visual field as being the result of a light field whose properties can be unambiguously described by the distribution of spatial illumination throughout the field and the

field lines of the illumination vector. There, however, the matter rests as far as practical lighting design is concerned.

The American Approach to 3D Lighting Design

The Brightness Ratio Method

The first technique of three-dimensional lighting design that was to gain wide acceptance not only in the United States was the "brightness ratio method." This method started from a very simple statement first made by Luckiesh[8]. He pointed out that for prolonged critical seeing and within an angle of 30 deg. from the line of sight—

brightness ratios of less than 1:5 are desirable,
brightness ratios of 1:10 and more should be avoided if reasonably possible, and
brightness ratios of 1:100 should not be tolerated.

These figures were later modified by the Committee on Standards of Quality and Quantity for Interior Illumination of the American I.E.S. (Q. and Q. Committee for short)[9], and the famous 3:1 brightness ratio was established. This referred both to

$$\frac{\text{brightness of visual task}}{\text{brightness of immediate surroundings}}$$

and to

$$\frac{\text{brightness of light-source}}{\text{brightness of background}}$$

It has long since been recognised that this approach to the brightness distribution over the visual field suffers from defects which are typical for the severe oversimplification that has been applied. Not only did a literal application of the method produce a considerable degree of monotony throughout the visual field, but it also often restricted fitting luminances quite unnecessarily. This was due to the fact that it paid almost no regard to the size and position of surfaces of high luminance within the field of view.

A modification proposed by P. Moon and D. E. Spencer[10], who suggested that the 3:1 ratio should not refer to the actual luminance distribution, but to the far more complex concept of "adaptation brightness," tried to overcome these limitations, but has never found general acceptance since it was difficult, if not impossible, to predict "adaptation brightness" at the drawing board stage.

This was not the case with the ordinary brightness ratios since a special set of inter-reflection tables was published by the Q. & Q. Committee[11]. These tables make it possible to calculate the average luminance of ceiling, walls and floor provided the primary flux distribution over the surfaces is known. The application of the tables is not particularly difficult, but it should be realised that they refer to perfectly diffusing surfaces, each of which is supposed to be of uniform reflectance, and to a ceiling of uniform luminance; in addition, they pay no regard to the influence which room furniture and occupants will later have on the general luminance pattern.

The most serious objection that can be raised against the inter-reflection method is that it is not capable of predicting any particular brightness pattern. All it does is to predict the average luminance of surfaces with a defined average reflection factor.

It is safe to say that the days of the "brightness ratio" method have now passed. It is being replaced by a totally different approach which has the considerable advantage

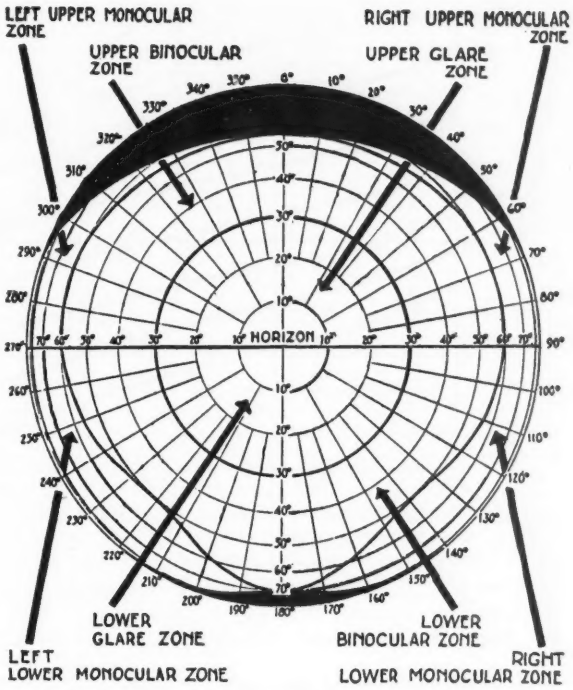
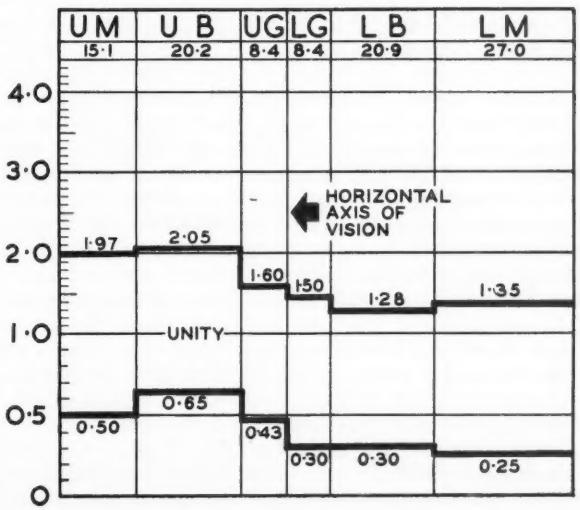


Fig. 2. Normal field of view of a pair of human eyes (after Logan). The right and left parts of the field outside the binocular area are the monocular areas into which only one eye can see at a time. That is, each eye has a separate and different field of view, but the two fields overlap to a considerable extent.

Fig. 3. Logan's flux analysis chart. This shows the range of variation in natural flux distribution throughout the field of view outdoors which is associated with the most comfortable seeing conditions.



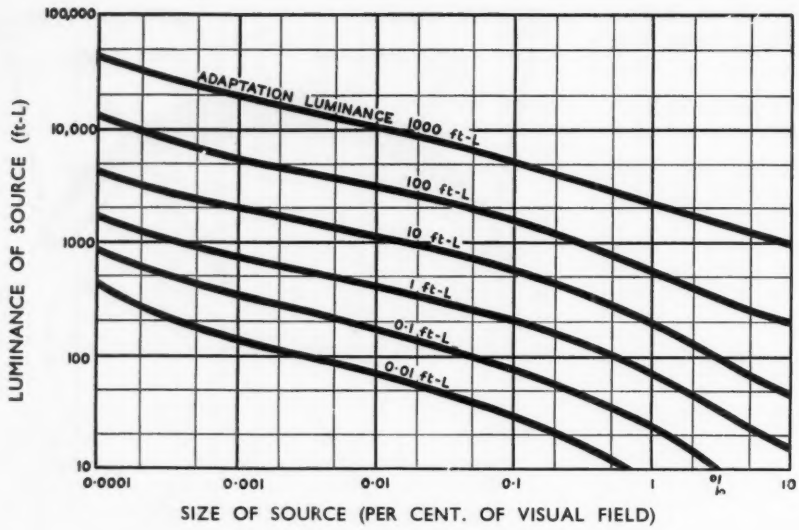


Fig. 4. Logan's chart of visual comfort. The lines on the chart indicate the BCD-thresholds for the corresponding adaptation levels marked in foot-lamberts.

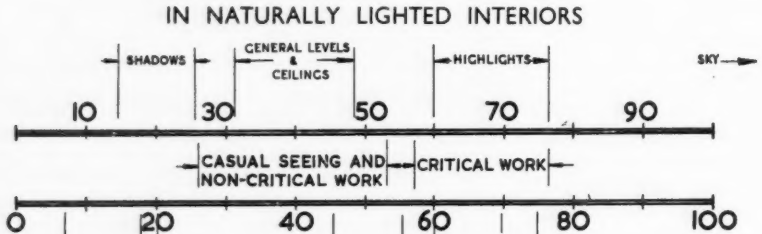


Fig. 5. Waldram's scale of apparent brightness. Typical ranges of apparent brightness in naturally and artificially lighted interiors are indicated.

of distinguishing clearly between the two most important aspects of " the design of the visual field," namely:

(1) the control of the maximum permissible luminance, and

(2) the formation of the general brightness pattern.

Logan's Method

Logan's method has undergone considerable changes and development since it was first published in 1941[12]. In the beginning Logan was only concerned with finding out what kind of general flux distribution throughout the visual field would lead to good and comfortable seeing conditions. His starting point was the thought that there must be a range of most suitable luminous conditions in *natural* lighting to which men have adapted themselves throughout their biological development. In Logan's opinion all available data point to these ideal luminous conditions prevailing along the 70 deg. F. annual isotherm where " man's original habitat " was probably located. Logan undertook extensive measurements of the general flux distribution throughout the visual field outdoors in the Wyndham Valley in central New York State during the period of the 70 deg. F. summer isotherm in 1943, 1946, 1947 and 1948 and in the Federal District of Mexico during the period of the 70 deg. F. spring isotherm in 1944. If the visual field is subdivided into eight zones as shown in Fig. 2 the measurements taken by Logan indicated that there existed a range of relative flux distribution throughout the various zones within which seeing conditions outdoors were accepted as comfortable by Logan's various observers. This range of comfort is shown in the flux analysis chart of Fig. 3.

Logan's second step was to assume that any lighting installation, i.e., not only natural but artificial as well, would be comfortable if its flux distribution came to lie within the limits given in Fig. 3, and he went to great trouble to supply the lighting engineer with the tools to apply this method of flux analysis, and special perspective work sheets and protractor charts were developed.

As indicated, Logan's chart is a flux analysis chart and not a luminance chart. This means that if he arrives in his analysis at a certain amount of flux reaching one of the eight zones of the visual field the chart will not tell whether this has been produced by a large area of comparatively low luminance or a small area of much higher luminance. However, from the comfort point of view the two conditions may differ vastly. In order to remove this deficiency Logan has more recently[13] added " the visual comfort prediction technique " to his flux analysis. This technique is based on the visual comfort chart shown in Fig. 4 which represents an elegant compromise between, and to some extent an extrapolation of, the results of direct discomfort glare obtained by such workers as Luckiesh and Guth, Petherbridge and Hopkinson, Putnam and Faucett. The lines on the chart are BCD-thresholds

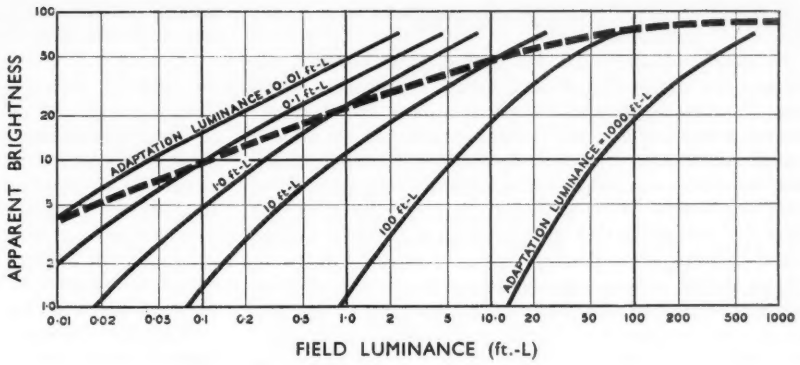


Fig. 6. Hopkinson's curves showing apparent brightness as a function of field luminance and adaptation level. The dotted line combines those points for which adaptation luminance is equal to field luminance.

(BCD = borderline between comfort and discomfort) for the corresponding adaptation levels marked in foot-lamberts. Since the chart refers to the glaring light-source being on the line of sight, readings taken from it have to be modified by a position index which takes the actual position of the glare source into account. Again Logan has developed an elegant chart to cope with this particular problem. For details see reference ([13]).

From what has been said about the Logan method it should be clear that it presents the first successful attempt to establish a method that will enable the lighting man to "design the visual field." However, it requires a complicated technique which is difficult to handle properly. Moreover some of the assumptions on which the method is based are open to doubt, particularly as far as the reliance on the "natural" flux distribution near the 70-deg. F. isotherm is concerned.

Waldram's Lighting Design Method

J. M. Waldram, chairman of the committee which prepared the report on the "Design of the Visual Field" mentioned earlier([1]), has more recently come forward with an entirely new approach to the design of an artificial lighting installation([3]). He first presented his new method in a paper to the I.E.S. in London in January, 1954. In this lecture the emphasis was on the fundamentals and less attention was paid to the actual handling of the method in practical design work. Subsequently this gap has been closed by an admirably clear description of the technique involved([14]).

Since it is beyond the scope of this article to give more than a brief outline of the principles of Waldram's method the interested reader is asked to look up the original articles, particularly reference ([14]), for further information.

The method can best be explained by referring one by one to the various stages through which Waldram carries the design of a lighting installation.

The first stage is represented by specifying the desired "brightness pattern." When speaking of "brightness pattern" Waldram does not mean "luminance pattern" since no luminance pattern will take into account that the eye is capable of adjusting itself to its surroundings, i.e., to get used to the light. To achieve this a scale of "apparent brightness" is used which was first developed by Hopkinson, Stevens and Waldram in 1941([15]). This scale is related to field luminance over a wide range of adaptation levels.

Fig. 5 shows this scale of apparent brightness where the figures 0 to 100 represent relative values of brightness. To this scale there have been attached some typical values for surfaces in naturally and artificially lighted interiors. The scale, as Waldram puts it, is new and both architect and lighting engineer will need some time to get the feeling of it.

As soon as the architect has learnt to think in terms of this scale he can easily attach to a perspective sketch of the interior for which the lighting is to be designed the values of apparent brightness which he would like to achieve for the various parts of the interior. In doing so he will have to pay due regard to the nature of the visual task(s), where the emphasis should be put, how shadows could assist in revealing form and structure, and last, but not least, he will have to watch that seeing conditions are comfortable.

This leads to the second stage in which the lighting engineer has to transform the architect's apparent brightness pattern into figures of luminance. The tool he needs to do that is given in Fig. 6. This represents a simplified drawing of a set of curves published by Waldram which relate apparent brightness, the eye's adaptation level, and actual field luminance to each other. Each curve in the diagram represents one level of adaptation (0.01; 0.1; 1.0 ft.-lamberts, etc.), and the dotted line combines those points on the chart for which field luminance is equal to adaptation level.

To find the value of apparent brightness to which the eye is accustomed in any particular case and which, therefore, determines the adaptation level one would have to inspect the architect's apparent brightness pattern and select an average figure of apparent brightness for the central field of view of a typical occupant of the room. Generally the central field of view extends to an angle of about 15 deg. to the horizontal line of sight. If this representative average value of apparent brightness is 46, for instance, we can use Fig. 6 and find where the apparent brightness of 46 intersects the dotted line. This point of intersection indicates on the abscissa the value of adaptation *luminance*, in this case 10 ft.-lamberts. The curve to follow to transform all individual values of apparent brightness in the architect's sketch is the curve running through the point of intersection and labelled: adaptation luminance 10 ft.-lamberts. Thus an apparent brightness

of 20 would become 2.5 ft.-lamberts and that of five would equal .35 ft.-lamberts.

In the third stage the luminance figures which we obtained by using Fig. 6 and which represent a truly three dimensional luminance pattern have to be transformed into illumination values. Almost invariably interior surfaces such as ceiling and walls will be matt. Their luminance is therefore determined by the product of total illumination prevailing on them and their reflection factor. If we are dealing with an existing building we can go and measure the reflection factors involved. If we are concerned with a design we shall have to consult with the architect what kind of colours he is intending to use and find out, for instance with the help of Munsell chips, what their reflection factors are going to be. If we divide the luminance figures by their appropriate reflection factors we get the total illumination required at the various points in question. Two examples are given in the following table:—

Adaptation Luminance (ft.-L.)	Apparent Brightness	Luminance (ft.-L.)	Reflection Factor	Total Illumination (lm/ft²)
10	60	17.5	0.8	22
10	20	2.5	0.5	5

The figures of total illumination established in this way are made up of two components:—

(1) the direct component consisting of the light received directly from the fittings, and

(2) the indirect component produced by the light coming from all surfaces of the interior such as ceiling, walls and floor.

Whilst it is comparatively easy to compute the direct component once the intensity distribution of the fittings is known, i.e., by the point-by-point method of calculation, the computation of the indirect component has hitherto, if at all, been treated as a problem of inter-reflection, and the fairly complicated mathematics that go with it have acted as a strong deterrent. Waldram, however, has shown that there is a much simpler solution to the "indirect component": each surface with which we are concerned in our interior is surrounded by a hemisphere (or "sky") which is made up of all the other surfaces of the room. The luminance of these surfaces is already known, since they were specified when we transformed the apparent brightness pattern into its equivalent luminance pattern. To find the illumination produced by such a hemisphere of known luminance distribution is a problem familiar to any lighting engineer who has worked on the design of natural lighting installations. Any of the methods of ascertaining the size of a projected solid angle, e.g., the Daylight Protractors of the Building Research Station, can be used. The product of projected solid angle and luminance "behind" it is numerically equal to the illumination produced on the plane into which the solid angle has been projected. This process of assessing the indirect component of illumination is repeated for all the points of reference which establish the general luminance pattern. If we subtract the value of the indirect component thus obtained from the total illumination we get the direct component, i.e., the illumination which must come directly from the lighting fittings. As stated above, the design of a lighting system that will provide the desired pattern of *direct* illumination is a straightforward task of illuminating engineering on classic lines.

It may, of course, happen that one or the other of the initially selected reflection factors turns out to be somewhat low and thus leads to impractically high figures of direct illumination to be made available at a particular point. In such cases the reflection factor may have to be increased to lower the required illumination without affecting the resulting luminance and the general brightness pattern.

A very important last step remains to be taken The design will have to be checked for the absence of discomfort glare. This means we shall have to find out whether the luminance of the fittings in the direction that matters will be within tolerable limits. This can be done, for instance, by using one of the glare formulæ or glare rating systems, e.g., the Petherbridge-Hopkinson formula, the Harrison-Meaker Glare Rating System, or Guth's Visual Comfort Index. In other words, this particular aspect presents comparatively little difficulty.

The Method Suggested by Bellchambers and Ackerman

An approach somewhat similar to that of Waldram but differing in technical detail has more recently been described by Bellchambers and Ackerman[16]. They, too, start with specifying a brightness pattern in terms of a luminance pattern. Their guide to the selection of suitable luminances is less specific than that of Waldram but probably easier to follow since it avoids any numerical relationship between brightness and luminance distribution.

The four basic steps in the Bellchambers and Ackerman scheme are as follows:—

(1) Determine the illumination on the task.

(2) Decide upon a suitable luminance for the immediate surround to the task and its reflection factor.

(3) Decide upon a glare condition which is acceptable for the task in hand or for the purpose of the room.

(4) From a consideration of an acceptable glare condition select a suitable lighting fitting and decide upon reflection factors and average luminances of ceiling, walls and floor.

In addition, thought is to be given to the treatment of surfaces where modelling is required or which may act as rest centres and to the amount of directional light required to achieve these aims.

Once the desired luminance pattern has been selected the distribution of direct and indirect (or inter-reflected) illumination over the surfaces has to be determined. For the calculation of the direct component Bellchambers and Ackerman propose the use of Einhorn's "Sector Flux" method[17] which in their opinion leads to the smallest errors consistent with simplicity. For the reflected component they use an empirical method based on a series of model measurements in which the ratio

$$\frac{\text{Total Illumination}}{\text{Direct Illumination}} \text{ or } E_r/E_d$$

is determined. Values of E_r/E_d have been obtained for the usual range of room indices and one given set of reflection factors of ceiling, walls and floor. Three different types of fitting (i.e., point source, diffusing source and louvred source) are considered. Although these data cover only a limited field they are applicable to most school and office lighting installations.

The absence of unwanted discomfort glare is checked in the same way as suggested by Waldram.

Some Final Remarks

Although it has not been possible within the frame of this article to go into every detail of these promising methods of designing the visual field, it should have become evident to all who have themselves experienced the many pitfalls of to-day's primitive methods of lighting design that with an approach like that of Waldram much time and effort can be saved and uncertainty avoided, particularly when new and important interiors have to be lighted. Of course, the methods are still quite new and experience will have to be gained with them, but they hold much for the future and it will be interesting to watch which of the two (or perhaps a combination of both) will appeal more to the practising lighting engineer.

Be that as it may, routine jobs will no doubt continue to be dealt with on customary lines. Where, however, special lighting schemes have to be developed and where the architect has every right to expect that his lighting ideas should be put into effect because they are part of a larger design, the lighting engineer should no longer work it out by "intuition" or trial-and-error methods; he should employ the modern tools of 3D lighting design instead.

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Book Reviews

"The Beama Catalogue, 1955-56," published for The British Electrical and Allied Manufacturers' Association (Incorporated) by Iliffe and Sons Ltd. for private distribution. Size LD4to (12 in. x 8½ in.). 1,034 pages. Bound full cloth.

The third (1955-56) edition of THE BEAMA CATALOGUE—the massive volume of more than 1,000 pages which is used throughout the world as a Buyers' Guide to the products and services of Britain's electrical industry—has just been published. It has been produced for The British Electrical and Allied Manufacturers' Association by Iliffe and Sons Ltd.

The descriptive catalogue pages have been designed throughout to a standard format, each section of the catalogue being printed in a distinctive second colour. These sections are classified as (i) Electrical Power Plant, (ii) Electrical Equipment in Industry, Transport and Communications and (iii) Domestic and Commercial Electrical Appliances, Lighting, Accessories and Installation Material. Over 770 pages of profusely illustrated announcements display the products manufactured by member firms.

To help overseas buyers, particularly where nomenclature is concerned, a five-language glossary of technical terms used in the Buyers' Guide is included. Product headings are listed in English, French, German, Portuguese and Spanish, thus providing a comprehensive cross-reference in five languages—a useful key to the technical equivalent terms used in other countries.

Other useful sections are the Classified Buyers' Guide, listing under more than 1,200 headings, the comprehensive range of electrical and allied equipment manufactured by BEAMA firms, and a Trade Directory giving principal addresses in the United Kingdom of all subsidiary or branch offices, etc., and over 4,000 names and addresses, grouped territorially, of member firms' overseas branches, representatives and agents.

THE BEAMA CATALOGUE, 1955-56, is an outstanding example of close co-operation between members of an industry for the furtherance of Britain's overseas trade; and over 15,000 copies have now gone to Trade Commissioners and representatives, overseas buyers, public utility officials, distributors and users in every country in the world.

"Illuminating Engineering Course," by H. Zijl. Philips Technical Library (Distributed by Cleaver-Hume Press, Ltd.) pp. 241, with 128 figs. Price 23s. 6d.

The title of this book may be misleading, for it is not really a textbook; it is more in the nature of a collection of discourses on various aspects of the subject. As a result, the chapters are not closely related, and vary in length from three pages (of which two are tables) to 22 pages. Oddly, some of the shorter chapters are boldly subdivided, whilst others which should be, are not; the longest and most comprehensive—on lamps—has only one very arbitrarily selected sub-heading (for metal filament lamps). Major changes of subject, e.g. from filament to discharge lamps, or from reflection to transmission, slip in with no greater indication than the beginning of a new paragraph. This procedure makes logical study very difficult. Since, in addition, there is no index, it also spoils its use as a reference book.

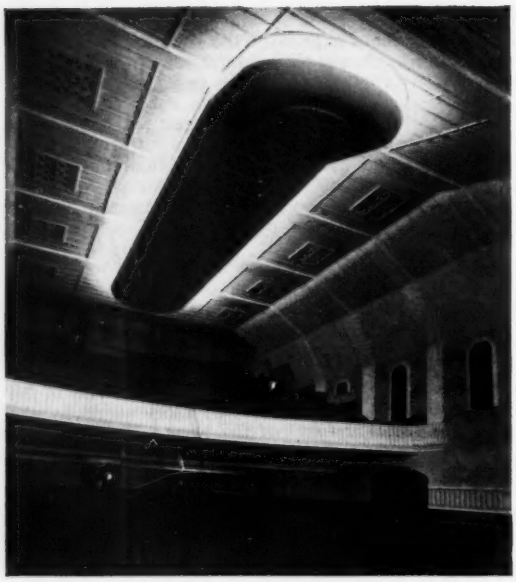
The technical standard expected of the reader is very low. The material included is a somewhat arbitrary selection, and the space devoted to different items is not related to their importance—one suspects more to their interest to the author. Radiation, photometry, vision, task analysis, lamps, interior lighting fittings and systems are all dealt with in the 23 chapters, and an extensive series of short questions and answers is included at the end of the book. The treatment is discursive rather than precise; one is left with the impression of a large number of ideas and rules of practice instead of a logical integrated scheme of basic principles. The presentation is very readable (if somewhat wordy) and well illustrated, but the book tends to fall between two stools, the requirements of the technical book for study and reference and those of the general book for the layman. S. S. B.

LIGHTING INSTALLATIONS

Motor car showroom at Nottingham

The main feature of the lighting of this motor car showroom (R. Cripps & Co., Parliament Street, Nottingham) is a suspended fibrous-plaster tray supported on five columns. It carries above its outer edge a double row of cold-cathode lamps approximately 260 ft. in length. This gives indirect illumination from the ceiling above, while direct but diffused lighting is provided by four rectangular fittings recessed into the underside of the tray. Each of these fittings houses three 5 ft., 80-watt. hot-cathode lamps and has an eggcrate louvred cover of polystyrene.

General lighting is from 12 suspended fittings each housing two 80-watt hot-cathode lamps. The illumination level is between 30 and 35 lm./ft.^{2} The installation was planned by the architect, R. W. Cooper, F.R.I.B.A., in co-operation with the General Electric Company, Ltd.; the work was carried out by R. G. Baker & Co., of Nottingham.



Cinema auditorium at Leeds

The Dominion Cinema, Leeds, the interior of which has been completely refurbished, has a large suspended central feature in which is mounted a continuous row of 27 5 ft., 80-watt peach fluorescent lamps, providing fully indirect lighting for the main part of the auditorium. A second indirect feature suspended beneath the balcony houses a further nine lamps. Both arrangements are operated by a remote-controlled dimming circuit.

Maintenance of the main ceiling feature—an important consideration with any indirect system—has been catered for by a continuous cat-walk down the centre, from which cleaning and re-lamping can be carried out via removable access panels. The control gear is housed within the suspended feature.

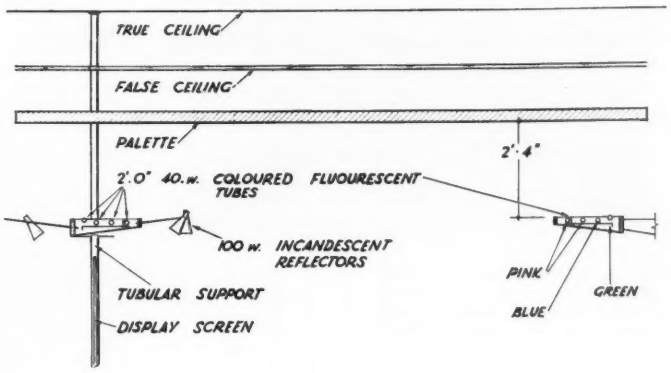
Current consumption is claimed to be low for an indirect installation, being 3.6 kW. for the auditorium, with the stage curtain and proscenium taking a further 1.8 kW. The installation was planned by Thorn Electrical Industries, Ltd., and carried out by Stokes Electrical Contractors Ltd. of Leeds.

SUSPENDED CEILING FEATURES

Wallpaper showroom at London

This wallpaper showroom at the premises of John Line & Sons, Ltd., Tottenham Court Road, London, has a suspended feature in the form of an artist's palette. Fluorescent lamps mounted above it silhouette its shape and give general lighting over the ceiling above, while coloured fluorescent lamps (pink, blue and green), concealed in fibrous plaster troughs, light the palette itself. To one of these fibrous plaster troughs are affixed spun-metal fittings holding 100-watt tungsten lamps, which are directed on to wallpaper display screens.

Other wallpaper displays are lit by 60-watt tungsten lamps in pendant fittings with plastics shades (on the left of the photograph) and by tungsten lamps in circular louvred fittings recessed into the underside of suspended canopies (as on the right of the photograph).

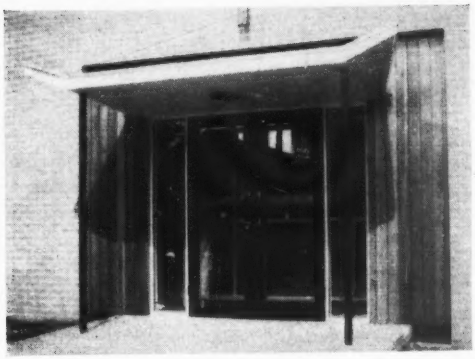


Freestanding displays in the centre of the showroom are illuminated by the circular canopy suspended from the palette feature, on to which is directed the light from five tungsten lamps in spun-metal reflectors. Architect for the showroom, Jack E. Dalling, L.R.I.B.A.; lighting by Thorn Electrical Industries, Ltd.; electrical contractors, John Hearson & Company, Ltd.

Church Hall

at Chessington, Surrey

Architect, Kenneth Wood, A.R.I.B.A., A.M.I.Struc.E., in association with Henry Blyth; electrical consultant, M. W. Bayley; lighting designed in conjunction with Philips Electrical Ltd.; main contractor, Thorogood & Sons, Ltd.; electrical contractor, E. W. Merredew & Sons, Ltd.*



The main entrance: the glazed doors and sidelights help to light the hall. Note the lighting fitting recessed into the underside of the canopy.

THIS parish hall is large enough to seat 250-300 people and high enough to be used for indoor games. It is on a fairly flat, open site, and comprises hall, stage, kitchen and lavatories. The stage is designed to serve also as a committee room. Extensions planned for the future include committee rooms/dressing rooms at the rear, and cloakrooms and offices at the front.

The main hall has a timber framework, with columns each comprising two 6 in. x 3 in. hardwood members bolted together and stressed skin plywood beams at 16 ft. centres. In-filling panels and gable walls are of 11 in. cavity brickwork. The low-pitch roof is of prefabricated timber trough units, 7 in. deep, finished with three-ply bituminous felt (with white spar surfacing) on a layer of ½ in. asbestos and ¼ in. asbestos sheeting.

The walls of the kitchen and lavatory wing are of 6 in. concrete blocks, faced externally with t. and g. vertical boarding of untreated cedar over a layer of felt. Internally the 11 in. brickwork is left fair-faced, with flush vertical and recessed horizontal joints. Concrete block walling and partitions (also of concrete blocks) are plastered; ceilings are of ½ in. fire-resistant acoustic boarding.

Heating is by means of gas-operated unit heaters suspended from the ceiling and fixed to the gable walls. In other rooms there is no heating, but the high level of insulation ensures reasonable temperatures. Hot water supply is from instantaneous gas appliances.

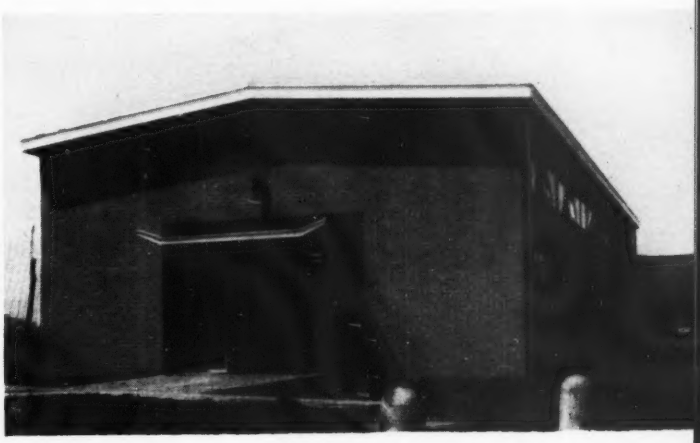
Lighting

The hall is lit mainly by 4 ft. deep, high-level, horizontally pivoted windows, with timber frames and pressed-steel sills, which run the full length of both sides of the hall. Additional daylight comes from the glazed entrance door and sidelights and from a large picture window in the north wall. The kitchen also has horizontally-pivoted windows, and two dome-lights are provided for lighting the corridor. Ceilings are painted white to give a high reflection factor.

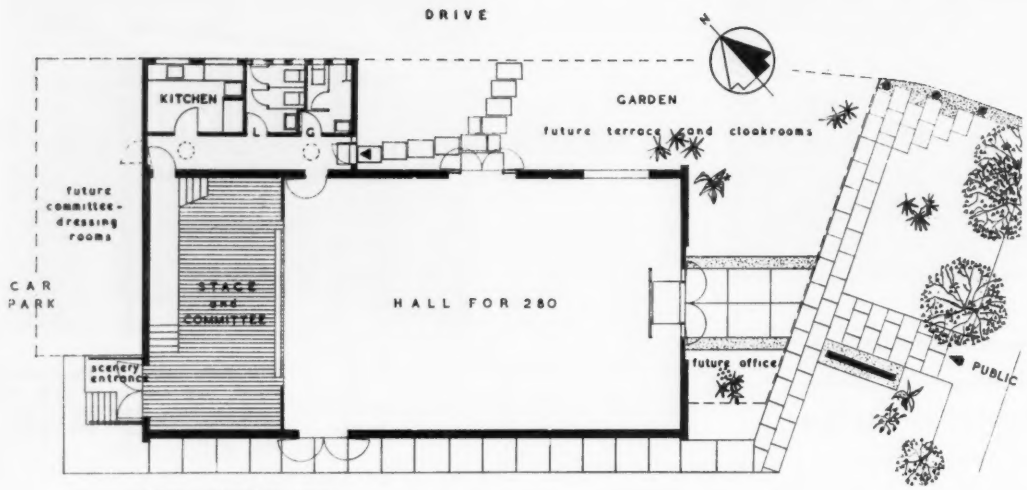
Artificial lighting in the hall is by means of two rows, each of seven instant-start fluorescent fittings, recessed into the prefabricated roof troughs. These were chosen partly for their low initial cost and partly because the character of the light output from the fluorescent lamps is tempered by that from the tungsten ballast lamps. There are expanded aluminium grilles, although, had it been financially possible, the architect would have preferred to use plastic egg-crates to give better "cut off."

"Sparkle" is provided by four wall-mounted diabolo-shaped fittings, each housing two tungsten lamps; for dancing, these are used alone. The stage is lit by four instant-start fluorescent fittings. The illumination level is about 7 lm/ft² and there is no evidence of glare.

Elsewhere, surface-mounted ceiling fittings are used, with diffusing covers, housing tungsten lamps, although



*Lighting fittings were supplied by Merchant Adventurers Ltd., Simplex Electric Co., Ltd. (external bulkhead fittings), Philips Electrical, Ltd., and the Universal Metal Furring and Lathing Co.



Plan, showing location of future extensions (scale: 1 in. represents 20 ft.).

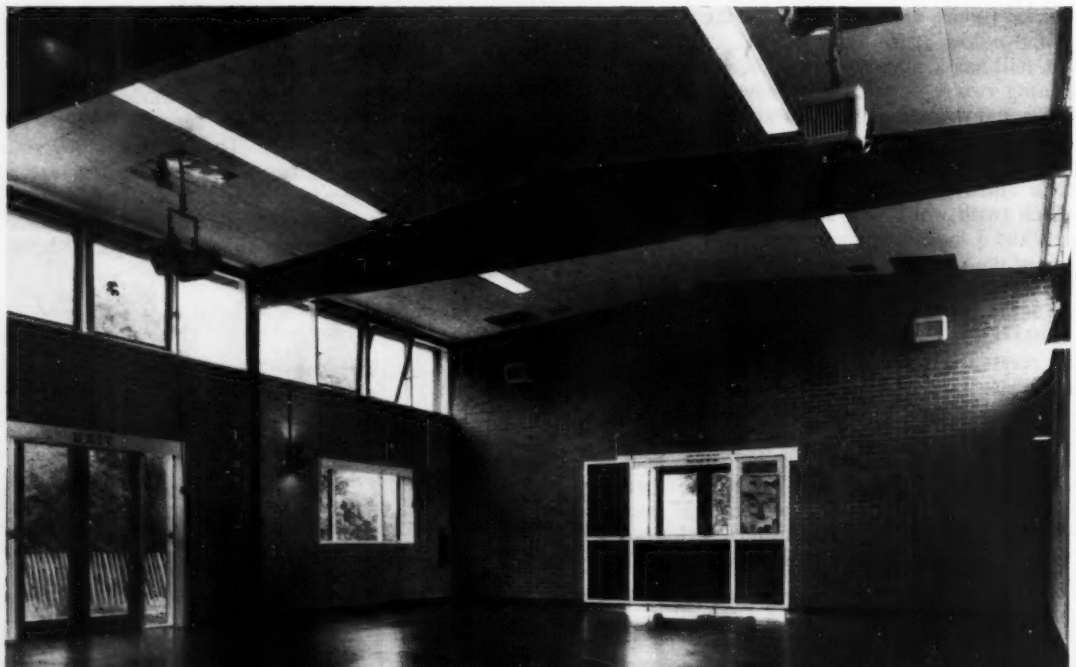
in the ladies' cloakroom there is an instant-start fluorescent lamp so that ladies' appearance is not altered when they pass from the hall to the cloakroom and vice versa.

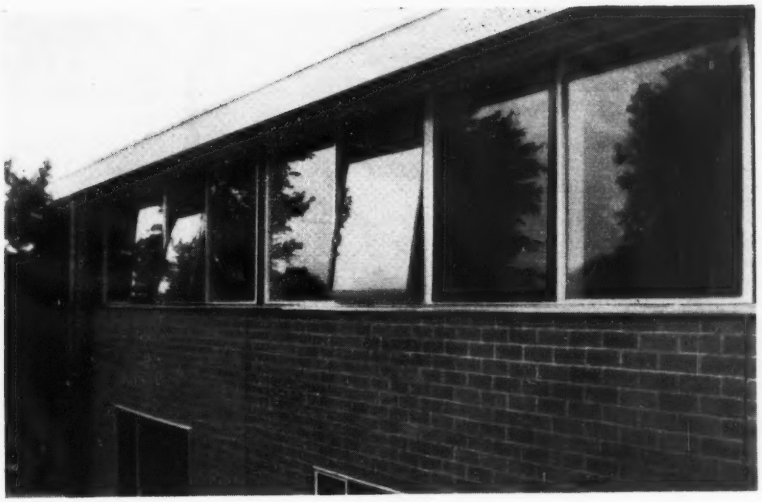
External lighting, mainly by means of recessed bulkhead fittings, includes a circular fitting recessed into the canopy over the main entrance.

The Installation

Since most of the brickwork is unplastered, great care was taken to conceal the conduit (and other services).

Interior of the hall, looking towards main entrance. The centre part of the draught screen is glazed so that the public can see into the hall. The two strips of lighting recessed into the roof contain instant-start fluorescent fittings, with tungsten ballast lamps.





High-level windows to the main hall, comprising softwood-framed, horizontally pivoted sashes, in 16-ft. bays.

where these are not within the depth of the roof. For this purpose a perspective of the interior showing the precise location of the runs was prepared for the use of the site fitters and electricians. Where external fittings were required they have been placed so as to coincide with the positions of the wall fittings inside the hall.

Distribution is by V.I.R. cable in screwed conduit. There is a ring-main circuit for both lighting and power, with three 13 amp. shuttered socket outlets with fused plugs in the hall and stage area and one in the kitchen. The switch and distribution board is of the iron-clad type, with cartridge fuses. Switch boxes are of cast iron, recessed where the walls are plastered, surface-mounted elsewhere.

* * * *

This church hall was chosen for illustration as a good example of an economical installation in a small building. Of the total tender price of £6,450, the electrical sub-contract (under £300) represented only 4½ per cent., or approximately 31d., per sq. ft. of floor area.

Church in King Square, London

Architect, Gordon Jackson and Partners; lighting designed by the Edison Swan Electric Co. Ltd.; electrical contractors, C. F. Taylor (Beckenham) Ltd.

A new lighting scheme has recently been installed in St. Barnabas Church, King Square, E.C.1, as a part of its reconstruction, necessary as a result of war-time bombing in 1940.

Structurally it was found that the church was not badly damaged, but that the continual penetration of water had left a toll of dry rot. The architects decided to divide the church with columns in the Wren style, so making a sanctuary and seating the congregation in the centre. This arrangement allowed for adequate vestries, a Lady-chapel and wide processional ways. The original church seated its choir in the sanctuary, whereas the new design gives them a place in the single west gallery grouped between the organ console and the organ. A double tier cast brass Flemish style electrolier is the central lighting fitting, incorporating 20 lights, 12 in the lower, eight in the upper tier, while direct lighting for the nave and sanctuary is provided by reflectors recessed in the main ceiling. Concealed projector lamps in the chancel cross-beam coping illuminate the altar, and in the aisles and side-chapel special light-candle brackets are used which incorporate a vase-shaped indirect lighting feature.

I.E.S. ACTIVITIES

London

At the joint meeting with the R.I.B.A. in London on December 13 a paper entitled " Lighting in Buildings—Training and Practice" was presented by Mr. Derek Phillips of the British Thomson-Houston Co., Ltd.

Mr. Phillips began by emphasising that co-operation between the architect of a building and the lighting engineer is essential if the artificial illumination is to be a positive contribution to its architectural unity. An overall picture of "lighting" in buildings in this country shows that rather than a positive contribution it is more often a disorganising feature of the environment; this ascribed to a " traditional animosity " between the two fields.

The basis of a profession lies, said Mr. Phillips, in the training of its students, and a brief analysis of the educational requirements of the two professions is revealing; first it shows that the R.I.B.A. examinations virtually ignore lighting, and that consequently architectural students can reach the end of their training with little or no knowledge of either natural or artificial lighting, and second, that students of illuminating engineering can complete the course for the City and Guilds examinations, and gain full marks without having any knowledge of the buildings for which as lighting engineers they will be planning lighting schemes. Furthermore it is possible for them to obtain full marks without answering any questions about " man." This suggests that at the end of their training each profession knows very little about the aims and problems of the other, a situation which can only lead to lack of understanding and an inability to co-operate.

In simple terms the subjects about which knowledge is necessary for the design of lighting in buildings are Man, Light, and Architecture. Generalising about each of these in turn it may be said that the architect appreciates man's aesthetic needs in terms of lighting, whilst the engineer takes the scientific view; the architect has a layman's attitude towards light, whilst the engineer has a scientific and technical knowledge; and finally the architect is concerned with architecture as an art and science, having a technical understanding of its difficulties, the engineer's interests being restricted to the technical problems involved. The only common meeting ground is in the technique of placing lighting equipment in buildings, and there is an absence of any common vocabulary of design. It is evident that the training of the two professions should be modified to enable these gaps to be bridged. In this way the architect should think of lighting in the initial stages of design, and the lighting engineer will acquire a sensitivity towards architecture. This will require an effort on the part of the educational authorities in the training of suitable staff and in the initiation of schemes likely to promote closer co-operation between the professions at both student and professional levels.

The criteria upon which lighting design is based must be under constant review, and architects and engineers have a part to play in the establishment of valid criteria which integrates the principles of architecture and the total needs of man.

Present lighting practice, in which the lighting equipment manufacturer is left to plan and design lighting schemes for buildings, was criticised on the ground that those designing the lighting are unqualified to deal with architectural problems, whilst the equipment at their disposal is limited to that manufactured by their company.

Mr. Phillips concluded by saying that the modifications to the educational facilities which he suggested should lead to a new relationship between the architect and the lighting engineer, more in line with the architect's relationship to other consultants, in which the professional status of the lighting engineer is increased. The architect would consider the lighting of his building initially and the lighting engineer would co-operate with him on the more complicated problems. The lighting engineer might be with one of the existing firms of electrical consultants, a member of a partnership covering such subjects as heat, light and sound, or even a specialist member of an architectural partnership; he would be without any commercial attachment. The role of the lighting equipment manufacturer would then be primarily concerned with the development of equipment to meet the pattern set by architects and consultants as the initiators of lighting schemes.

Manchester Centre

The Manchester Centre held its annual dinner at the Café Royal, Manchester, on November 2, under the chairmanship of Mr. F. Ainscow.

In proposing the toast " The City and Ports of Manchester," Mr. Ainscow referred to the plans to extend Ringway Airport and said that no doubt the operational and other lighting would be the finest possible. Replying to this toast, Alderman R. S. Harper, a former Lord Mayor of the City, said that a great deal was expected of lighting engineers and that they were providing an excellent service to the community.

The Mayor of Salford, Alderman G. H. Goulden, proposed the toast to the Society. He said he was very familiar with the activities of the Society and he thought that civic authorities owed a great debt to the Society for the work it had done over many years. He referred to the recent Presidential Address of Mr. Higgins, which, he said, would be a further help in making the work of the Society better known. He agreed with Mr. Higgins that the Society now had a responsibility towards the community, but he had no doubt whatsoever that the Society would continue to meet its responsibilities in this respect.

In replying to this toast the President thanked previous speakers for their remarks about the Society. He said that the various Centres all appear to have their own particular characteristics and he remarked on the vitality of the Society in the provinces. The Centres, he said, were doing very good work, and he mentioned the recent Conversazione on Light arranged by the Manchester Federation of Scientific Societies and for which the Manchester Centre had been largely responsible. He also referred to the proposals now being considered by the Council to broaden the scope of the Society and to deal with the qualifications to be awarded those professionally concerned with lighting practice. In this connection he emphasised that whatever form the Society's qualification might take the ultimate status that it achieved depended on the extent to which it was recognised and used by the industry.

The toast of " The Guests " was proposed by Mr. P. Corry and replied to by Dr. M. Barak, chairman of the Manchester Federation of Scientific Societies.

Glasgow Centre

The second meeting of the 1955/56 session opened with a reference by the chairman, Mr. Stuart, to the necessity for greater support by members if lecturers were to come from a distance to speak to the Centre. On this occasion Dr. Strange and Mr. Robinson had travelled from London to present their paper on the " Maintenance of Lighting Installations " and there was a very good attendance.

Dr. Strange opened the paper and discussed the implications of maintenance generally; he was followed by Mr. Robinson with some pertinent comments on the design of fittings. The author said they hoped to provoke some useful discussion among the audience, and themselves to learn from the personal experiences of those present. A prolonged interchange of information followed, in which many members and visitors took part; the references to fittings which were to a limited extent self-cleaning by the action of convection currents were especially interesting. It was suggested by some speakers that lamps with longer life might be designed for use in places where particularly difficult conditions of access were met, as in high bays or obstructed positions: better fittings, however, would be needed if cleaning intervals were to coincide with lamp replacement.

Birmingham Centre

The second meeting of the 1955/1956 session of the Birmingham Centre took place on Friday, October 28. A lecture on " Display Lighting " was given by Mr. J. A. Barker.

At the Birmingham Centre Ladies' Night: Mr. and Mrs. G. R. Hanson and Mr. and Mrs. A. G. Higgins.

Mr. Barker, who is connected with one of the leading fashion houses in this country, spoke not as a lighting engineer but as a display man.

Using many illustrations on the screen of what he considered to be good display, i.e., well-dressed windows, well lit, he drew attention to the dramatic and yet sales attractive windows which could be achieved with proper dressing and, more important after dusk, correct lighting. Mr. Barker called for more portable lighting equipment from the manufacturers, easily rigged and handled together with spot-light fittings which could be used in the display and yet not distract from the goods. He emphasised that as a merchant he sold goods, not lighting equipment. In respect of the modern tendency to build up high all-over intensities in windows with fluorescent lamps he deplored the practice whilst admitting that it might be suitable for certain types of store. A draped mannequin figure was used to illustrate how modelling and texture of material could be shown to advantage by using correctly placed light sources. The talk was extremely informative in as much as the theme ran along the lines of the users' needs and requirements as distinct from lighting technique. The subject of colour under different light sources was discussed and criticisms made by Mr. Barker.

The meeting was then thrown open for general discussion and Mr. Barker answered a barrage of questions and criticisms of his point of view from the meeting. At the end of the meeting a hearty vote of thanks was accorded to Mr. Barker for the manner in which he had delivered his lecture and responded to a very critical audience.

The annual "Ladies Night Dinner and Dance" of the Birmingham Centre was held on Thursday, November 10, 1955, at the Birmingham Botanical Gardens, Edgbaston, when 160 members and their ladies were received by the President of the Society Mr. A. G. Higgins and Mrs. Higgins, and chairman of the Birmingham Centre, Mr. G. R. Hanson and Mrs. Hanson. After the excellent dinner Mr. Hanson proposed the toast of "The Ladies" in a short but witty speech to which Mrs. A. G. Higgins suitably replied. The President was then called upon to say a few words to wind up the dinner and he made some kindly references to the work of the Birmingham Centre and its officers. Dancing, which followed the dinner, was enjoyed by the company until 1.0 a.m. and many congratulations were offered on the success of the function.

Leeds Centre

At the Leeds Centre meeting on November 21 a most interesting and instructive address was given by Mr. G. Black, a member of the Centre and an ophthalmic surgeon, entitled "The Prevention of Blindness." In addition to members several visitors were present, including doctors and opticians.

Mr. Black dealt with the causes of blindness, descriptions of various maladies, i.e., cataract and glaucoma, senile muscular degenration, etc., safeguards against industrial eye accidents, and prevention of blindness. Illustrations were by means of slides and equipment. In the course of his talk he emphasised that he was not one of those who took much notice of complaints of the deleterious effect of fluorescent lights on the eyes as compared with other sources. In fact, whilst some trepidation had been felt in photographing patients' eyes where it was essential to record the disability before "blinking" took place, electronic flash methods had been used in producing his slides without any apparent harmful effect.

A lively and lengthy discussion followed opened by Mr. A. G. Smith who complimented Mr. Black on his sympathetic approach to his subject. Amongst interesting points raised by Mr. Pearson were those of the effect of smoking and alcohol, on eyesight in reply to which it was indicated that it was possible, particularly where coarse brands of tobacco were used, to cause eye troubles and whilst little if any evidence existed in this country to substantiate similar complaints through alcohol the lecturer was assured by colleagues in other countries that this did occur there.

Mr. H. Moss said that 60 years ago few people used spectacles, whereas to-day most people seemed to need them. Was this caused by excess of light? Mr. Black indicated that blindness was not more prevalent, but the reason it was more noticed to-day was the care and attention now being given to the blind and partially blind. In his opinion whilst bad lighting caused symptoms of eye troubles it did not cause organic disease. Persons predisposed to glaucoma could have an attack in phases under bad lighting conditions. Those so affected should refrain from cinema visits as well as from television viewing.

Mr. Holden referred to the class of injury occasioned by motor accidents and the results of passing from a brightly illuminated interior or street to entirely different conditions. Replying, the lecturer indicated that double vision was quite common following any head injury and he strongly deprecated the use of head lights not correctly focused as these were a frequent cause of eye strain. He indicated, however, that the eyes were capable of extremely rapid adaptation under various lighting conditions. Mr. Black was further questioned as to the possibility of changing the shape of the cornea in certain cases which the questioner understood had been done in Japan. The lecturer said that whilst it was a theoretical possibility, in his opinion there was no prospect of it becoming a practical proposition.

In conclusion a vote of thanks was proposed by Mr. Goddard who said that the Centre was most fortunate in having had within its membership a number of eminent ophthalmic surgeons. The lecturer's handling of the subject had been instructive and sympathetic.

Sheffield Centre

The second sessional meeting of the Sheffield Centre was held on Monday, November 14, in the Medical Library of the Sheffield University, when Mr. J. Wilson, Lecturer in Architecture, Sheffield University, was the lecturer.

The lecture was concerned with the artistic effects of lighting, and while stressing the need for mutual understanding between decorator and illuminating engineer, the lecturer expressed the opinion that the engineer could well become a decorator in his own right, providing that he understood the elements of visual design. Lighting should not be seen as a cosmetic to architecture, but as fundamental

to its visual beauty. The decorator was confined to the application of surface colour and texture in order to bring desired effect; not so the engineer who could more easily create artistic pleasure and effects which, in some cases, were impossible to the decorator. The lecturer then explained some of the basic factors controlling the use of light hue, brilliance, source and direction to produce effects of "mood conditioning," alteration of structural appearance, directional flow, improving "eye appeal," dramatising form, and qualifying visual perception of objects and interior.

Dr. Benson proposed a vote of thanks to Mr. Wilson for the lecture.

FORTHCOMING EVENTS

LONDON

January 10th

Sessional Meeting. "Recent Developments in Photometry and Colorimetry," by G. T. Winch. (At the Royal Society of Arts, John Adam Street, W.C.2.) 6 p.m.

CENTRES AND GROUPS

January 4th

NEWCASTLE.—"Airport Lighting," by H. M. Ferguson. (At the Large Lecture Theatre, Grey Hall, Department of Electrical Engineering, King's College, College Road, Newcastle-upon-Tyne 1.) 6.15 p.m.

SWANSEA.—"X-Rays in Medicine and Industry," by K. Rawlings. (At the South Wales Electricity Board's Demonstration Theatre, The Kingsway, Swansea.) 6.30 p.m.

January 5th

CARDIFF.—"X-Rays in Medicine and Industry," by K. Rawlings. (At the South Wales Electricity Board's Demonstration Theatre, The Hayes, Cardiff.) 5.45 p.m.

GLASGOW.—"Lighting Problems in the Coal Industry," by W. Rochester. (At the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2.) 6.30 p.m.

NOTTINGHAM.—Members' Night. Informal discussion on the 1955 meeting of the International Commission on Illumination. (At the Demonstration Theatre of the East Midlands Electricity Board, Smith Row, Nottingham.) 6 p.m.

January 6th

BATH AND BRISTOL.—Members' Night. Short talks by members on interesting lighting installations. (At the Royal Hotel, Bristol.) 7 p.m.

January 9th

LEEDS.—"Street Lighting," by J. J. French. (At the Lecture Theatre of the Yorkshire Electricity Board, Ferensway, Hull.) 7 p.m.

January 11th

EDINBURGH.—"The Lighting Engineer," by G. E. L. Comrie. (At the Y.M.C.A. Small Hall, 4, Queen Street, Edinburgh.) 6.15 p.m.

January 13th

BIRMINGHAM.—Annual Dinner. (At the Queen's Hotel, Birmingham.)

EDINBURGH.—Dinner Dance.

January 17th

GLOUCESTER AND CHELTENHAM.—"Shop and Store Lighting," by R. L. C. Tate. (At the Fleece Hotel, Westgate Street, Gloucester.) 6.30 p.m.

LIVERPOOL.—"Lighting in Offices," by G. B. Lancaster. (Joint meeting with the E.C.A.) (At the Liverpool Engineering Society, 9, The Temple, Dale Street, Liverpool.) 6 p.m.

January 18th

NORTH LANCASHIRE.—"Light and its Effect on Plant Growth and Egg Production," by A. E. Canham. (At the Demonstration Theatre of the North-Western Electricity Board, 19, Friargate, Preston.) 7.15 p.m.

TEES-SIDE.—"X-Rays in Industry and Medicine," by J. E. Hood and G. Whiteley. (At the Cleveland Scientific and Technical Institute, Corporation Road, Middlesbrough.) 6.30 p.m.

January 19th

MANCHESTER.—"Light and Its Effect on Plant Growth and Egg Production," by A. E. Canham. (At the Demonstration Theatre of the North-Western Electricity Board, Town Hall Extension, Manchester.) 6 p.m.

January 23rd

LEEDS.—"Interior Lighting and Architect's Thoughts," by F. Chippendale. (At the E.L.M.A. Lighting Service Bureau, 24, Aire Street, Leeds 1.) 6.15 p.m.

STOKE-ON-TRENT.—Annual Dinner.

January 27th

BATH AND BRISTOL.—"Plastics in the Lighting Industry," by W. E. Harper. (At the South-Western Electricity Board, Old Bridge Street, Bath.) 7 p.m.

BIRMINGHAM.—"My most Interesting Lighting Problem." Contributions by members of the Centre. (At "Regent House," St. Phillip's Place, Colmore Row, Birmingham.) 6 p.m.

NEWCASTLE.—Dinner Dance. (At the County Hotel, Neville Street.)

Colour Group

At the meeting of the Physical Society Colour Group held on November 9, tributes were paid to the late Dr. L. C. Thomson, Director of the Institute of Ophthalmology, previous chairman of the Group and a worker of international reputation in the field of colour vision. He was a member of the British delegation at the Zurich meetings of the C.I.E. and his recent death at the early age of 42, after a very brief illness, is universally regretted.

Two technical papers were given at the meeting. Mr. E. H. Leach, of the University Laboratory of Physiology, Oxford, showed a large number of interesting slides of sections of the retina, demonstrating that three different types of cones could be distinguished in the retina of man and of the monkey, although there was no evidence that they performed different functions in colour vision. He also showed that the cell membrane of the outer segment of the cones was thickened discontinuously to form a spiral or a series of rings which might act as an opaque shield to obliquely incident light and possibly as a selective waveguide. In man, he said, the outer segment of some of the rods had a similar structure.

Dr. W. A. H. Rushton, of the Physiological Laboratory, Cambridge, described work on the absorption of light in the retinal pigments, particularly the rod pigment, rhodopsin, which takes part in twilight vision. Rhodopsin is absent from the fovea where there are no rods, and Dr. Rushton gave an account of work on foveal pigments, of which he said more than one were present in the normal eye, although subjects with the commonest form of colour defect (confusion of red and green) had only one.

Situations

Vacant

Crompton Parkinson Ltd., Doncaster, invite applications for the following vacancies: (1) DESIGNER/DRAUGHTSMEN for the mechanical development of F.H.P. Motors. (2) DESIGNER/DRAUGHTSMAN for very interesting work on the design of fluorescent lighting fittings. Experience on lighting equipment or other sheet metalwork desirable. Ideas and ability to translate them into production practice are more important than extreme competence in mechanical draughtsmanship. (3) Detail DRAUGHTSMAN for work in connection with the above. These positions offer splendid opportunities for men with ability, and a generous salary is envisaged. There is ample scope for advancement with the organisation and the company operates a superannuation fund to which employees contribute when eligible. Write in confidence to the Personnel Officer, giving details of qualifications, experience and age.

LENS DESIGNER required for an unusual—and unusually good—opening with Ford Motor Company Limited of Dagenham, Essex. An attractive starting salary, with subsequent increments according to merit, will be offered to a man fully conversant with all lens requirements, photometrics, tests, materials and finishes. Superannuation generous, and non-contributory. Reply to Salaried Personnel Department, quoting reference VCL.

TECHNICAL ASSISTANT (21-35) required for the Illuminating Engineering Service Department for the planning of lighting installations. Apply, stating age, experience, salary required, to Chief Lighting Engineer, The Benjamin Electric, Ltd., Tottenham, London, N.17.

Manufacturers of lighting glassware seeking advice of LIGHTING ENGINEER on the design of a new prismatic glass lantern. Scope also for other consultant work in that field. Apply Box No. 910.

NEW PRODUCTS

Domestic lighting fittings

Particularly suitable for domestic lighting are the smaller Crompton Parkinson Ltd. " New-Range " fluorescent fittings of twin 2-ft. 20-watt or 40-watt, 3-ft. 30-watt, and 4-ft. 40-watt sizes, which have been recently introduced. These fittings are available in a wide range of designs ranging from very simple batten fittings to excellently styled diffusing or louvred patterns.

Street lighting refractor

The Wardle Engineering Co. Ltd. announce a new street lighting refractor moulded from " Diakon " with sealed internal prisms and known as the " Dielikon." " Diakon " has great strength combined with lightness and outstanding weathering qualities and it cannot be easily broken. All the prisms are sealed and are dust- and damp-proof and all the exposed surfaces are smooth; cleaning is easily effected. The " Dielikon " is suitable for use with G.L.S. lamps up to 200 watts or with vertical burning discharge lamps up to 125 watts.

Diffusers for fluorescent lamps

Siemens Electric Lamps and Supplies Ltd. " clip-on " diffusers for bare fluorescent lamps are of translucent polystyrene, thus ensuring diffusion with a minimum decrease in illumination efficiency. Each section is 8 in. overall length and " unbroken " continuity is effected by means of automatic mortise and tenon assembly. Suitable for any 1½-in. diameter fluorescent lamp, fixing is by " push-fit " over the lamp. Sections are just as easily removed for cleaning. Packs of seven sections for all 5-ft. lamps are available at £1 7s. 0d. plus tax (6s. 1d.); similar boxes of six sections for all 4-ft. tubes cost £1 3s. 0d. plus tax (5s. 2d.).

Quartz tubular infra-red lamp

In order to provide higher radiation intensities than are normally obtainable from an ordinary 250-watt industrial infra-red lamp, Philips Electrical Ltd. have developed what is claimed to be the first 1,000-watt quartz tubular infra-red lamp in Europe. Because of the thermal strain to which glass is likely to be subjected, the tube is made of quartz, which is not only particularly resistant to high temperatures but, because of its low co-efficient of expansion, also lends itself to rapid local cooling. The lamp diameter is 10 mm.; the length of the filament is approximately 290 mm.; the life of the lamp is approximately 5,000 hours when operated on the rated voltage. The colour temperature is approximately 2,200 deg. K. The list price of the lamp is £4 4s.

Colour corrected mercury fluorescent lamp

The General Electric Co. Ltd. announces that on January 1, 1956, its range of Osram colour corrected mercury fluorescent lamps will be extended by the introduction of a lamp rated at 250 watts. The list price will be £6. Similar in appearance to the 400-watt lamp of this class, the new lamp shares the same advantages of good colour rendering, high efficiency and universal burning position. It may be operated in conjunction with standard 250-watt control gear, and in the majority of installations will be fully interchangeable with the 250-watt MA/V lamp. Magnetic deflectors are not required. Average light output throughout life is 9,250 lumens, which is nearly 20 per cent. higher than the figure for the existing 250-watt MA/V lamp.

Bulkhead fitting

A new rectangular bulkhead fitting has been developed by The General Electric Co. Ltd. to house a 200-watt Osram lamp. The new unit is an extension of the company's range of bulkhead fittings, and weighs 18½ lb. It is constructed of cast iron and has a prismatic glass cemented into the front glass-frame. The frame is sealed to the body of the unit by a gasket. A polished aluminium internal reflector with a porcelain E.S. lampholder is provided. There are three tapped ¾-in. E.T. entries for through or back entry to the unit, and plugs are supplied for two of the entries when they are not in use. The unit (F.64032) measures 11¼ in. in length, and has a width of 7½ in. It is finished in light grey stove enamel. The price complete is £5 10s.; a spare glass costs £1 and spare gaskets are 5s. each.

Flameproof fitting

Siemens Electric Lamps and Supplies Ltd. announce a new flameproof fluorescent fitting suitable for lighting vehicle inspection pits. The fitting has the Buxton Certificate for Group 2B. gases and is approved by the War Office, by whom it is being used. The unit consists of a 4 ft. 40-watt fluorescent tubular lamp enclosed in a case of cast aluminium alloy. Fitted with a front cover and a recessed window of ⅛-in. armour-plate glass retained by a frame of cadmium plated mild steel, sealing is effected with a special gas-proof cement. Designed and constructed to conform with B.S.229 and B.S.889, the fitting has terminal boxes at each end which are separated from the main compartment by flameproof bulkheads. To obviate glare, the top section of the " Birmabright " reflector is finished in white lacquer and the lower anodised clear. Reflector mounting and shape ensures a throw of light upwards.

Trade Notes

The Stella Lamp Company Limited have announced their entry into the fluorescent lighting fittings market in a four-page, two-colour leaflet describing the first of the " Blue Label " range. This range includes ceiling batten, ceiling vee, industrial trough, slotted light trough and angle reflector fittings. All are distinguished by a form of guarantee in the shape of a blue label. Copies of the leaflet, which gives full technical data and prices of the new range, are obtainable from Stella Lamp Company Limited, 37/39, Oxford Street, London, W.1.

The General Electric Co. Ltd. opened a new depot at Magnet House, Derby Street, Preston, on December 5. The new depot, under the management of Mr. R. G. Galloway, will be able to give better delivery services in the North Lancashire area than has hitherto been possible. The trade will also benefit from increased stocking and counter facilities. The telephone number of the Preston Depot is Preston 57871/2.

H. W. Field & Son Ltd. announce that rumour is being circulated to the effect that they have ceased the manufacture of fluorescent lighting control gear. The company states that since the installation of their new impregnating plant production has trebled and that the delivery position of their " Everlasting " ballast has been improved greatly. Wholesalers and contractors are assured of delivery within seven days, and fittings manufacturers four weeks from receipt of order with weekly supplies on schedule.

Considerable increases in the initial lumens and average lumen output through life for all sizes of the Atlas " Warm White " fluorescent tube are announced by Thorn Electrical Industries Limited. The new performance figures represent improvements of up to 18 per cent. on previous figures. It is emphasised that these new efficiency figures are taken from tests on production tubes.

The well-known 15-day hand-wound time switch, Venner type BF.43, which has had more than a quarter of a century of proved usage, has now been redesigned with larger contacts incorporating a magnetic arc disrupter which increases its capacity from the original five up to 10 amperes 250 volts A.C. or D.C. It has the same overall dimensions and the new model, which will be known as Type BF.55, will fit into existing BF.43 boxes. This improved contact design is being included without increasing the price of £9 1s. 6d. complete in a cast metal case. This switch is particularly suitable for the control of street lighting, porch lighting, shop

window lights, electric signs, electric fires and traffic bollards, etc., with rating up to 10 amps., A.C. or D.C.

Altogether, over 1,800 Mazda lamps have been supplied to the British Trans-Antarctic Expedition. G.L.S. lamps supplied from two six-kw. generators will light the Expedition's 72 ft. x 27 ft. pre-fabricated living hut. Bus interior type bulbs of 20 watts and 12 watts, supplied from batteries, will be used as bunk and movable bedside lights respectively, while in the engine room, Mazda portable Gripper hand lamps with long leads will be used for vehicle maintenance. The special chamber where hydrogen for the weather balloon is generated will be lighted from outside through "Perspex" gas-tight panels to obviate the risk of explosion.

Trade Literature

ROTAFLEX (GREAT BRITAIN) LTD., 90, Regency Street, London, S.W.1.—Two brochures describing a complete range of domestic fittings made from the colourful "Rotaflex" materials, including prices.

BERRY'S ELECTRIC LTD., Touchbutton House, Newman Street, London, W.1.—A neat envelope containing several new catalogues describing decorative lighting fittings in contemporary and period styles, hewn oak and wrought iron, including details and prices.

HUME ATKINS AND CO. LTD., 66, Victoria Street, London, S.W.1.—Catalogue No. T.F.55 containing an extensive range of standard commercial fittings together with a new range of contemporary designs, well illustrated and prices included.

GENI PRODUCTS, 90, Regency Street, London, S.W.1.—Envelope containing many brochures describing each of the lighting fittings from the "Disderot Collection" of domestic fittings. Also two supplements describing new domestic fittings with prices.

CRYSELCO LTD., Kempston Works, Bedford.—A leaflet giving details and prices of the new industrial trough reflector; a leaflet showing details and price of a new spotlamp holder and a brochure giving full details of industrial fluorescent lighting fittings, including auxiliary gear.

PHILIPS ELECTRICAL LTD., Century House, Shaftesbury Avenue, London, W.C.2.—Philips Technical Information Service which gives a list of bulletins, booklets, folders, wall charts available as well as the books in Philips' Technical Library. Also a new leaflet dealing with Philips Continuous Adaptable Light System which gives full particulars of the system, listing its advantages of low installation cost, flexibility, maintenance and appearance.

METALFORM LTD., 258, Gray's Inn Road, London, W.C.1.—An illustrated brochure describing the "Multilux" fluorescent lighting fitting.

FREDERICK THOMAS AND CO. LTD., Everton Buildings, Stanhope Street, London, N.W.1.—Illustrated brochure giving details and prices of the latest glass "Efteelite" lighting fittings.

J. A. CRABTREE AND CO. LTD., Lincoln Works, Walsall, Staffs.—Publication No. 1175 describing a complete range of flush A.C. switches, including triple and twin switch units, together with a range of switch and fuse gear productions.

THORN ELECTRICAL INDUSTRIES LTD., 105-109, Judd Street, London, W.C.1.—Brochure giving details and prices of the complete range of "Atlas" Popular Packs. These fluorescent fittings are marketed complete with control gear and lamp ready for immediate installation from any ceiling point.

STELLA LAMP CO. LTD., 37-39, Oxford Street, London, W.1.—A new catalogue of the current range of lamps and lighting equipment containing particulars and prices of general and special lamps, infra-red brooding units, fluorescent lamps, discharge lamps and lighting control gear.

THE BRITISH THOMSON-HOUSTON CO. LTD., Crown House, Aldwych, London, W.C.2.—A brochure entitled "Mazda Family of Fluorescent Fittings" which fully illustrates a wide selection of industrial and commercial fittings as well as simple methods of installation and ways of interchanging the fittings.

Personal

It is announced by Philips Electrical Ltd. that MR. N. LOWRY, who has been employed for some time in the lighting division at Philips head office in London, has been appointed branch accountant at the company's branch in Belfast. Mr. Lowry, who took up his appointment as from November 14, is a Belfast man who has spent the last several years in England.

The north-west region of Philips Electrical Ltd. announce that MR. ALAN E. BLAND is now representing their lighting division in south-east Manchester, including the districts of Hyde, Stockport and Stalybridge. After matriculating at Stretford Grammar School, Mr. Bland joined the Dunlop Rubber Co., Ltd. He left that organisation in 1946 to serve with the Royal Corps of Signals and attended a War Office course in salesmanship and sales organisation whilst stationed in the Middle East. After demobilisation in 1948, he attended a further one-year course at a commercial college and gained a diploma in business administration before resuming his career as a sales representative.

H. W. Field and Son Ltd. announce the appointment of MR. NORMAN E. SHEPHARD, A.M.I.E.E., as chief of their illuminating engineering department. He will be responsible for the designs of the company's lighting equipment. Mr. Shephard has recently been with B.T.H. Co., Ltd., and previously with Ekco-Ensign Electric Ltd. During the war he was with the Admiralty.

Miscellany

Chitting seed potatoes

A new fluorescent lighting fitting specially developed for use in seed potato chitting houses was shown for the first time on the G.E.C. stand at the Smithfield Show. Seed potatoes are frequently stored in trays stacked in glass potato chitting houses. The fittings comprise two fluorescent lamps mounted end to end and hung vertically between stacks of trays from overhead conduit. The control gear is fixed to the bottom of the fitting, and the whole assembly can easily be moved along between rows of trays as required. The light emitted by the lamps encourages the growth of short, sturdy shoots ideally suitable for planting. Two lengths of fittings are available, one with two 5-ft. 80-watt lamps and the other with two 4-ft. 40-watt lamps.

Lighting in ships

Britain's newest and, incidentally, the world's second largest cableship, the C.S. *Ocean Layer,* owned by Submarine Cables, Ltd., is illuminated throughout by fluorescent lighting provided by Siemens Electric Lamps and Supplies, Ltd. General lighting in the dining saloon is provided by two "egg-crate" louvred panels 21 ft. long by 2 ft. wide, suspended from the ceiling; the crew's public room is lit by ceiling-mounted twin 3-ft. fluorescent lighting fittings, supplemented by fluorescent cornice lighting. Instant start lamps are used in the installation on a 230-volt 50-cycle supply. Total loading of the lighting is approxiately 41 kw.

A new electroplate

A new and brilliant electroplate which does not tarnish under the most severe atmospheric conditions was demonstrated by the Tin Research Institute at the recent Building Exhibition. The electroplate, which is an alloy of 65 per cent. tin and 35 per cent. nickel, has been developed after several years of research in an endeavour to find a hard-wearing, permanently-bright and corrosion-free finish for metals. It has a distinctive appearance, being warm and rose-tinted, in sharp contrast to the usual bluish tone of common plating. It is simple to apply and by virtue of its exceptional "throwing power" can easily penetrate into deep recesses. The process costs no more than other kinds of plating and there are no patent restrictions on its use.

POSTSCRIPT By "Lumeritas"

SOME weeks ago I was present at a discussion on eyesight in industry organised by the Ophthalmic Group of the Socialist Medical Association. The meeting took place in one of the committee rooms of the House of Commons and was apparently intended to elicit views as to the need for an Industrial Ophthalmic Service apart from the facilities already existing under the N.H.S. It was pointed out that there are various reasons for which industrial workers may be in need of visual care, one of these being on account of conditions of lighting not suitable for the particular nature of their work. In this connection a memorandum tabled by the organisers of the meeting drew attention to the fact that the I.E.S. has laid down certain minimum standards for different kinds of work. "This has been done with great care, and while at present existing only in the form of recommendations, should be enforceable by legislation and more use made of skilled consultants in this field." One of the three speakers who opened the discussion was Mr. G. G. Eastwood, of the Printing and Kindred Trades Federation, and it was interesting to hear him state that fluorescent lighting has been found so satisfactory in composing rooms—where troublesome glare from the metallic type has hitherto been difficult to avoid—that its use in all printing offices is being encouraged. Even for colour-printing, he said, fluorescent lighting is being used quite successfully, using, of course, appropriate lamps. This user testimonial to the virtue of fluorescent lighting drew no contrary view from the audience, in which there was a preponderance of trades unions representatives. True, one representative mentioned the stroboscopic effect—more by way of inquiry than of complaint. Among those present were several officers of the I.E.S. who could have dealt with this query, but before they had time to rise it was answered by a knowledgeable ophthalmic optician.

FROM the remarks of another contributor to the discussion I gathered that the optical manufacturing industry, however, is not noteworthy for good lighting. Subsequently I happened to look through a technical journal devoted to this industry and came across an advertisement illustrating a new lens blocking machine with an almost incredibly badly arranged "built-in" local light. Rising from the work-bed was a swan-necked tube carrying a B.C. holder and a filament lamp surmounted by a fluted metal "scollop-shell" reflector. The lamp was shown at eye level and not more than six inches in front of the operator, by whom more than half of the lamp itself could be seen. With this arrangement both direct and reflected glare would be acute. How such an antiquated contrivance came to be incorporated in a newly designed machine is difficult to understand and it certainly does not comply with the Factory Lighting Regulations.

WHATEVER the effects of "coloured" light may be I imagine that most of us will find it hard to believe that making the blind see is one of them. However, a report recently published by the Rudolph Steiner Schools, near Aberdeen, claims that by treatment with colour-light-baths "a blind boy, with eyes scarcely developed, has been trained to 'see' through his skin!" The superintendent of the schools, Dr. Konig, believes that a blind child has great possibilities of unfolding his power of seeing, of perceiving an impression of light and colour, by means of his skin, particularly the parts on the forehead and cheek. He describes the case of another child who was deaf and blind and whose eyes were subjected to beams of coloured light, then a lighted candle was set between the child and a teacher and, "soon the child was repeating exactly gestures made by the teacher." This child can now "pick up things from the floor which he 'sees' at a distance of two to three yards and he walks around as if he could see." Years ago a French scientist claimed to have demonstrated that seeing is possible with part of the skin other than those which normally develop into structural parts of the eyes, but I do not remember that light-baths were said to be a necessary preliminary. His claims were investigated by the sceptical French Academy which remained sceptical—as I do.

AT the beginning of a new year many of us "look" ahead, perhaps not generally in any predictive mood so much as with the object of reckoning up the events we know are "billed" to happen and, most particularly, those to which we "look" forward with pleasurable anticipation. (And, by the way, being—as we are—under the dominance of sight and light, how often we say "look" when we mean "think" and "see" when we mean "comprehend"!) Many of us, too, make New Year resolutions, at least some of which are traditionally supposed to be of reformatory or elevating intent. I must confess that I have abandoned this practice for the doubtless unworthy reason that I am not bound to indulge in self-reproach when, later on, I fail to keep my resolutions. Actually, however, this is a piece of self-deception for, if I make no formal resolutions, I usually formulate some pious hopes which are their equivalent and, alas, just as usually have to kick myself for backsliding. But as to the forseeable events to which I am looking forward in this new year, one is the I.E.S. Summer Meeting at Harrogate. I am not going to indulge in prediction, but I shall not be surprised if this meeting turns out to be a record one. I have, incidentally, seen a copy of the notice of this meeting which will shortly be circulated; the organisers have realised that a meeting of the importance of this one deserves a better notice than it has had in the past. A well designed notice is good advertising and is bound to have better pulling power than the flimsy documents which were used to announce previous summer meetings.

Less with anticipatory pleasure than with curiosity and interest, I am looking forward to the outcome of the 1956 Dow Prize essay competition. This competition is a challenge to lighting engineers and I wonder how many will accept it and what differences of viewpoint will emerge.